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Appendix 6

The effectiveness of interventions, including family interventions, to prevent weight gain or maintain a healthy weight in children aged 2–5 years

EVIDENCE SUMMARY TABLES

1. INTERVENTIONS TO PREVENT WEIGHT GAIN, OR IMPROVE BEHAVIOURS ASSOCIATED WITH THE MAINTENANCE OF A HEALTHY WEIGHT (DIET AND ACTIVITY), IN CHILDREN AGED 2–5 YEARS

SUMMARY

Evidence of efficacy for weight management/reduction

Of the five included studies (four randomised controlled trials [RCTs] and one controlled non-randomised trials [CCT]) that have published outcome data, three RCTs found some evidence that the intervention prevented unhealthy weight gain leading to obesity, compared with controls. Ethnic minority children from Head Start programmes in Chicago that received a 14-week diet and physical activity (PA) intervention (Hip-Hop to Health Jr) had significantly smaller increases in body mass index (BMI) compared with control children at 1-year follow-up (0.06 vs. 0.59 kg/m^2; difference –0.53 kg/m^2 (95% confidence interval [CI] –0.91, –0.14), p = 0.01; and at 2-year follow-up, 0.54 vs. 1.08 kg/m2; difference –0.54 kg/m^2 (95% CI –0.98, –0.10), p = 0.02, with adjustment for baseline age and BMI.

Girls (but not boys) that received the intervention in the STRIP study gained slightly less weight between the ages of 2 and 3 years compared with controls. The already overweight children that received the intervention in the study conducted in China gained much less weight over time compared with controls – but this study was very intensive, costly, and demanded a substantial amount of effort from the parents of the 2–5-year-olds.

There were two studies that reported that interventions were not effective in preventing unhealthy weight gain (Dennison 2004; Healthy Start 2004). For example, Dennison (2004), who investigated if seven educational sessions would encourage reduction in television (TV) viewing, found that although the intervention produced a significant reduction in TV viewing it did not significantly alter anthropometric measurements of the subjects, i.e. did not improve weight loss.

Evidence of efficacy for diet/physical activity outcomes

Eight of the nine completed studies (five RCTs and three CCTs) reported improved diet and/or PA outcomes compared with the controls. These included interventions as part of the Healthy Start (USA), STRIP and the MAGIC (pilot) studies. The MAGIC pilot study, which focussed on a programme of structured PA, reported that there was a significant improvement in PA (based on accelerometry output) of children. Mean fat intake at age 5 years was significantly lower in the intervention group of the STRIP study. The Hip-Hop to Health Jr. study demonstrated only one significant difference between intervention and control children regarding diet/activity outcomes and this was a difference in percent of energy from saturated fat at 1-year follow-up (11.6 vs. 12.8%, p = 0.002). Improved outcomes from primary studies included He et al. (2004), McGarvey et al. (2004) and Koblinksky (1992). McGarvey et al. (2004) reported that attending educational sessions significantly improved the frequency of engaging active play with their child and increased frequency of offering the child water. Koblinksky (1992) reported that a parent education programme focusing on nutrition-related behaviour in Maryland, USA, resulted in the intervention group consuming significantly more fruits, vitamin C rich fruits, green vegetables, breads, rice/pasta and orange vegetables than the control group. The only study that reported no effectiveness was an intervention (Horodynski, 2004; controlled before and after [CBA]) that focused solely on nutrition education – a change in knowledge and attitudes was insufficient to change behaviour.

Evidence of corroboration in the UK

Many of the interventions cited within the included studies could be implemented in the UK. It seems reasonable to assume that such interventions could be implemented within the existing programmes and services, e.g. Healthy Start (UK), Sure Start, Child Centres and other existing services (e.g. Healthy Living Centres), and also into nursery and day care provision.

EVIDENCE TABLE 1: INTERVENTIONS TO PREVENT WEIGHT GAIN IN CHILDREN 2 TO 5 YEARS AND THEIR FAMILIES/CARERS

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
Evidence of efficacy (internal validity) for weight maintenance/reduction					
Dennison 2004 Cluster RCT 1+	Sixteen preschool and day care centres in rural upstate New York enrolling children between 3 and 5 years of age. Intervention group *n* = 93, mean age 3.9 years, 47% male, 93% white. Control group *n* = 83, mean age 4.0 years, 53% male, 100% white. The parents were well educated with half having a college degree or higher.	To evaluate an intervention to reduce TV viewing.	**Intervention group:** Seven educational sessions (over 10 weeks) that included a party to celebrate not watching TV for a week Information sent home for parents, children encouraged to read rather than watch TV. **Control group:** Safety and injury prevention programme. This was part of larger 'Brocodile the Crocodile' health promotion programme, which lasted for 39 weeks (no published papers identified on further search).	Sixteen centres entered and completed TV intervention element, 3 of 93 children in intervention group lost to follow-up and 10 of 83 in control group. **Difference in mean changes:** Mean change in intervention group – mean change in control group (95% CI): BMI (kg/m^2) per year: –0.36 (–1.22, 0.50), *p* = 0.38 Standardised BMI/year: –0.19 (–0.83, 0.46), *p* = 0.54 Triceps skinfold thickness (mm/year): –0.41 (–3.52, 2.70), *p* = 0.78 Weight (kg): –0.73 (–1.84, 0.39), *p* = 0.18 Although intervention produced significant reduction in TV viewing it did not significantly alter anthropometric measurements.	Parent-reported child's TV viewing. Only published study on TV viewing intervention in preschool children identified. Generalisability limited as conducted in small centres in rural community with relatively small sample size lasting only 10 weeks.
He 2004 Individual RCT 1+	Two kindergartens of 'average living standard' in Qingdao, China, children aged 4 to 6 years. Intervention group, *n* = 24, 17 male, weight 27.2 (4.1) kg, BMI 19.6 (1.4) kg/m^2.	To explore an effective intervention programme to control obesity in preschool children, to reduce obesity and related diseases at school age.	A 1-year family-based educational programme with joint participation of parents, childcare workers and head of the kindergarten, aimed at changing improper attitude and behaviour of weight control, provided in various forms, such as parent meetings, training of the childcare workers and lessons on children's health. Behaviour	No reported loss to follow-up. Mean change in weight (kg, 95% CI), intervention vs. control: +1.3 (–2.5–+5.2) vs. +5.4 (+3.0–+9.0) kg. Mean change in BMI (95% CI), intervention vs. control; –1.4 (–0.6 to +2.2) vs. +1.5 (–0.3 to +3.8) kg/m^2.	Mean age not reported. All children in intervention and control are obese at baseline – but meets inclusion criteria otherwise.

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	Control *n* = 19, 15 male, weight 27.5 kg (4.0), BMI 19.3 (2.8) kg/m^2.		correction and dietary adjustment (reducing speed of eating, intake of snacks, sugary drinks and fast food), right amount of exercise (active role play and more outdoor activity) emphasised in educational activities and the daily life of the children. No further details reported regarding 'non-intervention control' group. Measurements were taken before and immediately after 1-year intervention.	Author concluded the programme was safe and effective, alleviated obesity levels without restricting normal height growth.	No details of randomisation process. Two groups of obese children were randomised and one group of normal weight children were not randomised but included in study for comparison (data not extracted for normal weight non-randomised group). Reviewers assumed CI for intervention change in BMI was –0.6 to –2.2. Author not contactable by email.
HEALTHY START (USA) 2004 Williams 1998a, 1998b, 2004; Bollella 1999a, 1999b; Spark 1998; D'Agostino 1999 CCT (quasi-randomised cluster trial) 2++	Nine Head Start preschools in upstate New York that served minority children (2 to 5 years old) from families with annual incomes below national poverty line (less than US$15,000 for family of four). Mean age (months) A = 48.3 (6.9), B = 47.9 (6.4), C = 49.3 (6.1) Boys (%) A = 51.4, B = 51.3,	To evaluate the impact of a multi-component cardiovascular health intervention 'Healthy Start' to promote heart healthy behaviours and decrease cardiovascular disease risk factors.	Modification of preschool food service to reduce saturated fat content 30% or less total energy from fat and 10% or less total saturated fatty acid intake. **Group A:** Food service and supplementary nutrition education (skills based, lessons on healthy eating) – in school and family based. **Group B:** Food service only (education component focused on safety and accident prevention) – in school and	787 enrolled, 88–93% children in all three groups followed up for anthropometric testing. Since no significant difference found between food service and food service plus nutrition education group on outcomes, these groups were combined for analysis. Neither intervention had a significant effect on gain in weight-to-height ratio). The impact of the intervention varied by ethnicity (p = 0.04) but not	Quasi-randomised, six centres able to modify food service were randomly assigned by centre, three centres unable to modify food service served as controls. Many baseline differences between groups, the most significant/relevant of which are: differences in

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	C = 50.4 African-Caribbean (%); A = 54.2, B = 44.9, C = 39.8 Hispanic (%); A = 14.2, B = 1.9, C = 57.4 White (%); A = 31.6, B = 53.2, C = 2.8		family based. **Group C:** Control (no food modification and education component focused on safety and accident prevention) – in school and family based – this group was not randomised. Parent meetings on health themes held 2–3 times year for all groups. Three-year intervention, baseline measures in fall 1995 and measures planned semi-annually. Only reports outcomes at follow-up between 4.8 to 6.6 months post-baseline. Study ongoing.	gender ($p > 0.05$). There was a significant difference in weight to height ratio for white participants but not African American or Hispanic. Mean difference (95% CI) change in weight-to-height ratio from baseline to follow-up between groups A + B vs. C: African American = 0.004 (–0.007, 0.014) White = 0.034 (0.023, 0.045), Hispanic = –0.006 (–0.020, 0.009).	ethnicity (only 2.8% white in control vs. 31.6 and 53.2% in other two groups). Time to follow-up significantly different between groups: A = 5.8 (0.6) months B = 6.6 (0.5) months C = 4.8 (1.0) months from baseline to follow-up.
Hip-Hop Fitzgibbon et al. 2002; Stolley et al. 2003 Cluster RCT 1+	3–5-year-old African American and Latino minority children in 24 Head Start sites in Chicago. **Mean age (months):** Intervention: 48.6 months(7.6) Control: 50.8 months(6.4) % Female: Intervention: 49.7% Control: 50.5% % Black: Intervention: 99% Control: 80.7%	Weight change in low-income ethnic minority children. Didn't recruit or retain enough children for original power calculations, power recalculated to detect a difference of 0.35 standard deviations.	Reduction in fat, increase in fibre, increase in PA and inclusion of family are main elements of intervention. Theoretical base is combination of social learning theory and transtheoretical model of stages of change. Children had 45 min, three times per week for 14 weeks, hands-on learning about go and grow foods ('foods that will hel*p* you go and grow') vs. slow foods ('will make you slow'), using puppets of characters from each of the food groups.	Fourteen-week active intervention plus 2 years follow-up. Intervention *n* = 179 Control *n* = 183 Intervention children had significantly smaller increases in BMI compared with control children at 1-year follow-up (0.06 vs. 0.59 kg/m^2; difference –0.53 kg/m^2 (95% CI –0.91, –0.14), $p = 0.01$; and at 2-year follow-up, 0.54 vs. 1.08 kg/m^2; difference –0.54 kg/m^2 (95% CI –0.98, –0.10), $p = 0.02$, with adjustment for baseline age and BMI.	Trial was piloted for 3 weeks where elements were changed. Curriculum materials translated and taught in both English and Spanish. Twelve of the sites were randomly assigned to receive the intensive intervention and 12 were assigned to the general health intervention.

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	Baseline BMI: Intervention: 16.5 (1.5) kg/m^2 Control: 16.7 (2.0) kg/m^2 Intervention *n* = 197 Control, *n* = 212		Parents had weekly newsletter, homework (compensated US$5 if completed), and twice weekly 30-minute low impact aerobic classes at children's Head Start sites. Control had 20-min class once per week for 14 weeks spent on general health activity. Parents had weekly newsletter.		Assessors not blinded at baseline but blinded at follow-up.
STRIP Lagstrom 1997; Niinikoski 1997; Rask-Nissila 2000; Talvia 2004 RCT 1+	Babies from well-infant clinics, Turku (Finland), randomised at 7 months of age. Clinics visited regularly by over 98% of Finnish families so sample probably represented range of socio-economic classes (but no details reported).	To evaluate euenergetic, low-saturated fat, low-cholesterol diet to reduce children's exposure to high serum cholesterol values.	Families received individualised counselling at 1–3 month intervals from child aged 7 months to 2 years then twice per year to age 7 years, letters sent home to children between visit to increase interest in food and nutrition. When child aged 7 years separate counselling sessions given to child and parents. Counselling based on constructivist theory of learning. Optimal diet = energy without any restriction, protein 10–15% energy; carbohydrates 50–60% energy; up to 2 years fat 30–35% energy and after 2 years fat 30% energy (unsaturated to saturated fat ratio 2:1). Encouraged to use vegetables, fruit, berries, whole-grain products. Up to 2 years recommended daily supplement of Vitamin A and D_2,	1062 randomised (56.5% eligible age cohort) at age 7 months. 289 of 540 assessed at child age 10 years in intervention group and 268 of 522 in control. Dropout nearly 50%. Infants in both groups were breastfed for mean of 5 (SD 4) months. Relative mean weight gain (SD) (kg) at 2 years in boys: 1.3 (7.6) *n* = 235 vs. 0.7 (7.3) *n* = 221 Relative mean weight gain (SD) at 3 years in boys 1.5 (7.1) *n* = 225 vs. 0.5 (7.3), *n* = 215, *p* = 0.86 Relative mean weight gain (SD) (kg) at 2 years in girls 2.2 (8.6) *n* = 212 vs. 0.9 (9.3), *n* = 219 Relative mean weight gain (SD) (kg) at 3 years in girls 0.8 (8.4) *n* = 200 vs. –0.1 (9.8), *n* = 202 *p* = 0.17 Low fat intake in very young	Important long-term evidence to address restricting dietary intake in the very young. Nordic Nutrition Recommendations propose fat should comprise 30–35% of energy intake and daily energy intake should average 1300 kcal (5.4 MJ) in 1–3-year-olds; previous study in Finnish children with 3-day food records showed mean daily energy intake in 1–2-year-olds was 1167 kcal (4.9 MJ) of which 33% came from fat and 16% came from protein.

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			breast or formula milk encouraged until at least 12 months (control 1.9% fat cow's milk after 12 months, intervention group advised to replace missing fat milk with vegetable oil). Control families seen twice per year until aged 7 years then once yearly, did not receive any detailed counselling on risk factors of atherosclerosis. Follow-up from age 8 months to 10 years.	children did not adversely affect vitamin and mineral intake and normal physical and neurological growth and lessened age-associated increases in serum cholesterol.	
Evidence of efficacy (internal validity) for diet/physical activity outcomes					
Worsley 2004 Systematic review – five studies: four of which were RCTs and one CCT 1+	Hammond et al. 1998 Kindergarten study in Canada. Mean age: 5 years. Intervention group *n* = 67; 57% male 43% female; control group *n* = 56, 45% male 55% female.	To evaluate whether familiarity with 16 various foods and willingness to eat them would be affected by a nutrition education programme.	The intervention groups were introduced to eight of the test foods. The early childhood nutrition education programme reinforced recent childhood acquisitions of gross and fine motor controls, cognitive skills, language abilities and social competencies at the same time as associating healthy eating habits with social fun and learning. **Intervention:** 7–12 months (throughout school year). **Follow-up:** 7 months.	Education programme had no direct impact on children's willingness to eat specific foods. More parents of the intervention group ($p < 0.001$) than control group children reported their child had stated exposure to a food at school when requesting it at home. Children in the study consistently stated that they were willing to eat a greater number of foods than their parents perceived.	Consumption of food was not measured directly. Instead, stated willingness to eat the foods was assessed using food models. Designation of foods into either food category (introduced or non-introduced) was restricted by the foods available as food models and by the design of the study that included equal representation of the four food groups in each food category.

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
					Active involvement in a situation of interest to preschoolers will more likely result in accurate memory later on.
	Lagstrom et al. (1997). Finnish study (part of STRIP). Intervention group *n* = 540; control group *n* = 522.	To examine whether counselling to parents would reduce a child's intake of saturated fat and cholesterol as well as ensuring adequate energy intake.	The intervention included a nutrition education programme, which included individualised dietary counselling focused on the amount and type of fat in the children's diet. Part of STRIP – see above for intervention details **Follow-up:** 38 months from beginning of intervention (when child aged 8 months).	Children's intake of fat (saturated and polyunsaturated) and cholesterol were significantly improved/lowered with intervention compared with control ($p < 0.01$). After the age of 13 months, the cholesterol intake of the children in the control group exceeded that of the children in the intervention group by 20 mg ($p < 0.01$). The intervention group consumed 3% less (of their energy intake) saturated ($p < 0.01$) and 1% more (of the energy intake) more polyunsaturated fats ($p < 0.01$) than the control group at 13 months and older.	Families knew which group they belonged to (intervention or control).

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
	Sangster et al. (1999). Long Day Care Centres (LDCCs) in South Sydney Australia Intervention group *n* = 40 day care centres; Control group *n* = 20 day care centres. Of the 40 intervention centres 23 centres were privately run and 17 centres were community or council based- reflecting the mix of community/council and private centres in the area.	To evaluate the Good Food for Children (GFFC), which was a multi-strategic intervention aimed at improving the nutritional adequacy of food provided in childcare centres.	Assessment of centres' menus with feedback, advice on development of policies and development of workshops for childcare staff. The time between pre and post-test data collections was 14 months.	Generally, the GFFC intervention improved LDCC menus and consequently the nutritional quality of food available to children attending these centres. At post-test 97% of intervention centres had a planned cycle menu for at least 1 week as opposed to 87% in pre-test. There was a 45% increase in the number of centres with adequate served of dairy food on their menu ($p < 0.05$), a 21% increase in the number of centres with adequate servings of bread and cereal ($p < 0.05$) and a 36% increase in the number of centres that diluted fruit juice before serving ($p < 0.05$). Control centres showed no significant improvements.	—

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
	Heino et al. (2000). Finnish study (part of STRIP). Intervention group *n* = 100; Control group *n* = 100. All children were aged between 3 and 5 years.	To examine sodium intake and dietary sodium sources of preschool-age children.	The intervention included a nutrition education programme, which included individualised dietary counselling focused on the amount and type of fat in the children's diet. Salt reduction in the children's diet was not included in the counselling before children were aged 5 years. Part of STRIP – see above for intervention details **Intervention:** 24 months **Follow-up:** 24 months	Nutrition counselling had minimal influence on children's sodium intake. Children's mean daily sodium (NaCl) consumption (intervention and control combined) was 1600 ± 527 mg (4.0 ± 1.3 g), 1900 ± 504 mg (4.8 ± 1.3 g) and 2200 ± 531 mg (5.5 ± 1.3 g) at the ages of 13 months and 3 and 5 years of age respectively. Intervention children consumed as much or slightly more sodium than the control children at all ages studied. Half the sodium consumption was derived from added salt in the commercially prepared or homemade foods.	The assessment of children's sodium intake is unreliable. It has been suggested that 3-day food records may underestimate sodium intake by as much as 11%.
	Dixon et al. (2000) Children (*n* = 303) aged 4–10 years with elevated LDL-cholesterol, recruited from paediatric practices in suburbs north of Philadelphia, USA. Intervention group *n* = 148; Control group *n* = 155. Majority were white children from middle	To evaluate the impact of nutrition education promoting lower dietary fat on the overall diet quality in children.	The intervention children were either assigned to the parent–child autotutorial (PCAT) programme, a 1-week home based self-instruction nutrition education programme, or nutrition counselling from a registered dietitian. **Intervention:** 10 weeks **Follow-up:** 3 months	Nutrition education that promoted lower dietary fat improved children's overall diet quality. However, numerous dietary behaviours important for long-term health remained unchanged. Children who received PCAT or counselling significantly improved their overall diet quality (–0.6 and –0.4 change in diet quality index (DQI) scores) compared with at risk control children. Children who received either nutrition education were more likely to meet the recommendations for three components of the DQI (total fat,	Results may not be generalisable to all children.

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
	to upper income households.			saturated fat, sodium), but did not improve their intakes of three components of the DQI (vegetables and fruits, complex carbohydrates, calcium) at 3 months.	
Overall conclusions from Worsley 2004 Two out of the five studies published were effective. The authors concluded that the few studies highlight the lack of evaluation in this area, but do suggest that intervention *may* be worthwhile. Although there is little evidence, this age is a key time to establish good nutritional habits especially when involved with parents.					
Dennison 2004 Cluster RCT 1+	As above.	As above.	As above.	Difference in mean change from baseline between intervention and control (95% CI): TV/video-viewing hours per week: –4.7 (–8.4, –1.0). Alternate activities as a result of reduced TV viewing were not stated/measured. No significant changes or differences between intervention and control groups in the frequency of snacking whilst watching TV or the number of days family ate dinner together or watched TV during dinner (actual data not reported).	As above.
He 2004 Individual RCT 1+	As above.	As above.	As above.	'Through intervention, improper behaviours toward obesity out of misunderstanding were changed remarkably, which is beneficial to weight control of obese children. At home their overeating, consumption of double breakfast, eating speed and food intake ($p < 0.01$) but not amount of exercise. At kindergarten eating speed, dietary intake and	

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
				amount of PA ($p < 0.01$). With the guidance of parents and childcare workers in the intervention, obese children's behaviours at home and at kindergarten were changed toward the direction beneficial to weight control.'	
HEALTHY START 2004 Williams 1998a, 1998b, 2004; Spark 1998; Bollella 1999a, 1999b; D'Agostino 1999 CCT (quasi-randomised) 2++	As above.	As above.	As above.	No actual measurements of children's nutritional intake was taken but cholesterol levels were assessed. Results showed change in total cholesterol from baseline to follow-up by intervention ($p < 0.05$). A nutrition quiz was also administered. Adjusted overall means were higher in A than B (0.606 vs. 0.589) but difference on complete test was not significant.	As above. Cholesterol is included here as a proxy measure of nutrient intake.
Hip-Hop Fitzgibbon et al. 2002; Stolley et al. 2003 Cluster RCT 1+	As above.	As above.	As above.	Demonstrated only one significant difference between intervention and control children regarding diet/activity outcomes and this was a difference in percent of calories from saturated fat at 1-year follow-up (p (11.6% vs. 12.8%, $p = 0.002$).	As above.
Horodynski 2004 (NEAT) CBA 2–	Low-income, rural families with toddlers/pre school children.	Whether an intervention programme focussing on nutrition education	Early Head Start programme called NEAT linked child development and positive parenting practices with food and nutrition education through empowerment, to promote healthy	Attrition rate = 0% No significant differences found between the control and intervention group on dietary intake.	Parents self-selected intervention or control group (selection bias), toddlers age 1–3 years (average not

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
	n = 38 families. Four rural counties in Midwestern USA. Annual income varied between US$17,484 to $32,189 (all below poverty level) and unemployment varied between 5 and 9%. Mean age of adults = 30 (range 16–76) years.	versus a non-treatment control group would improve the nutritional habits of pre school children and their families.	mealtime environment, good communication, children's self-regulated feeding behaviour. Three × 90-minute lessons in each of four Early Head Start sites in groups of four to five mainly mothers. **Intervention:** 3 weeks **Follow-up:** 6 months This pilot study is guiding an ongoing 3-year study. US$5 cash incentive to complete questionnaire at baseline and US$10 at 6-month post-test.	Authors conclude that knowledge alone is insufficient to change eating habits.	reported).
Koblinsky 1992 CCT 2+	Six New York city and five Maryland Head Start centres. Intervention *n* = 89 Control group *n* = 82 Mothers; 80% were aged between 21–39 years. All mothers had income below poverty level for 1987 (US$11 519 for a family of four).	The effects of a parent education programme on the nutrition related behaviour of Head Start parents and the dietary intake of their preschool children.	Treatment group mothers received 13 weekly newsletters and four nutrition workshops (informal presentation, hands on, small group discussion and food demonstrations on nutrition, feeding, meal planning and food shopping). Thirteen-week intervention with follow-up 1 to 2 months later.	80% of mothers who completed pre-programme assessment also completed post-programme assessment. In Maryland children in the intervention group consumed significantly more ($p < 0.01$) fruits, vitamin C rich fruits, green vegetables and breads and also significantly more ($p < 0.05$) rice/pasta and orange vegetables than the control group. No significant differences in food consumption were found between	Parents self-report. Preschool children but mean age not reported. Groups were not balanced at baseline: there were significantly more Hispanic mothers in New York treatment group (76%) compared with New York control group (59%).

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
	85% Maryland mothers were white or black; two-thirds of New York mothers were Hispanic.			New York treatment and control group children. Significantly more treatment group mothers in both states reported reducing sugar in child's diet compared with control.	

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
McGarvey 2004 (Special supplemental nutrition programme for WIC) CBA 2+	Two WIC (Women, Infants and Children) clinics in Northern Virginia, USA. Low-income mothers of 2–4–year-old children. Intervention *n* = 185 parents; Control *n* = 151 parents. **Baseline for completers:** Mean age in intervention group = 3.06 (1.93) years; in control = 3.15 (0.9) years. % Male in intervention group = 46% and in control = 49% BMI (kg/m^2) in intervention = 17.2 (1.93), control = 17.38 (1.688).	To assess the benefits of a programme to promote parental behaviours and prevent obesity in preschool children.	Intervention (modified educational content of sessions) vs. normal educational classes provided by the WIC. Intervention group participants attended educational sessions once every 2 months and had an individual session with a WIC nutritionist every 6 months. Follow-up 1 year.	65% intervention group completed 12 months (*n* = 121) and 43% control grou*p* completed (*n* = 65). Pre-test and post-test differences by site were significant for 'frequency of engaging in active play with child' ($p < 0.01$) and frequency of offering the child water' ($p < 0.01$). Intervention demonstrated significant improvement in offering child water and frequency of engaging in active play with child.	Outcomes were Parental self-report which is susceptible to bias. Differential rates of follow-up between intervention and control sites. Groups were not balanced at baseline: Spanish-speaking participants had significantly lower baseline scores for frequency of watching TV whilst eating and frequency of offering child water through the day compared with English-speaking participants.
Reilly et al.	3–4-year-old children	Whether a	Structured PA delivered three times	Children in the intervention group	

First author, study design, research type, quality	Study population	Research aim/question	Intervention details and length of follow-up	Results	Confounders/comments
(2003) MAGIC (Pilot Study) RCT Grade pending – to be confirmed on publication of full study	who attend nursery schools in Glasgow. Intervention group *n* = 30; Control group *n* = 30.	programme of structured PA would increase activity levels and improve basic motor skills.	per week (total of 90 min) supplemented with home based health education for 12 weeks.	showed a significant improvement ($p < 0.01$) in both total activity and motor skills development. There was a 40% increase in accelerometry output, as an index of total PA, on days when the intervention was delivered and an increase of 29% on days on which it was not (no further details).	

STRIP Lagstrom 1997; Niinikoski 1997; Rask-Nissila 2000; Talvia 2004 RCT 1+	As above.	As above.	As above.	Daily energy intake was lower in the intervention than the control group but this difference did not reach significance. Daily energy intake (kJ) boys + girls at 2 years (intervention vs. control): 4714 (829) *n* = 424 vs. 4802 (863), *n* = 436, *p* = 0.13. Daily energy intake (kJ) boys + girls at 3 years (intervention vs. control): 5070 (905) *n* = 392 vs. 5191 (980), *n* = 398, *p* = 0.07 % Daily Energy intake (calories) from total fat significantly lower in intervention than control group girls: mean difference total fat (95% CI): –2.5 (–3.1, –1.8), *p* < 0.01. % Daily energy intake (calories) from total fat, intervention vs. control girls (mean, SD): Age 4 years: 29.8 (4.3) vs. 32.2 (4.6) Age 7 years: 30.4 (4.3) vs. 31.8 (4.7) Age 10 years: 29.5 (4.5) vs. 32.1 (4.6) Total daily energy intake was lower in the intervention group girls than the control group girls but this did not reach significance. Mean difference total energy (calories, 95% CI) –134 (–275,to 6), *p* = 0.06. Total daily energy intake (calories) intervention vs. control girls (mean, SD): Age 4 years: Total energy 1253 (217) *n* = 173 vs. 1286 (227) *n* = 187 Age 5 years: Total energy 1343 (231) *n* = 126 vs. 1406 (229) *n* = 133, *p* = 0.027 Age 7 years: Total energy 1492 (240) *n* = 144 vs. 1515 (237) *n* = 151 Age 10 years: Total energy 1669 (320) *n* = 110 vs. 1638 (291) *n* = 116	

STRIP Lagstrom 1997; Niinikoski 1997; Rask-Nissial 2000; Talvia 2004 RCT 1+	As above.	As above.	As above.	% Daily energy intake (calories) from total fat significantly lower in intervention than control group boys: mean difference total fat (95% CI): –1.9 (–2.4, –1.3), $p < 0.001$. % Daily energy intake (calories) from total fat, intervention vs. control boys: Age 4 years: 30.6 (4.9) vs. 32.2 (4.5) Age 7 years: 30.7 (4.6) vs. 31.6 (4.5) Age 10 years: 30.5 (4.7) vs. 32.2 (5.6) Total daily energy intake (calories) was lower in the intervention group boys than the control group boys. Mean difference total energy (calories, 95% CI) –231 (–376 to –86), $p = 0.002$. Total daily energy intake (calories) intervention vs. control boys (mean, SD): Age 4 years: Total energy 1348 (216) $n = 198$ vs. 1404 (252) $n = 194$ Age 5 years: Total energy 1461 (248) $n = 139$ vs. 1484 (239) $n = 141$), $p = 0.41$ Age 7 years: Total energy 1629 (238) $n = 164$ vs. 1662 (274) $n = 165$ Age 10 years: Total energy 1796 (306) $n = 118$ vs. 1890 (349) $n = 137$ At age 5 years mean fat intake in intervention group was 30.6% of energy intake vs. 33.4% of energy intake in the control group ($p < 0.001$). At age 5 years mean saturated fat intake in intervention group was 11.7% total energy intake vs. 14.5% total energy intake in control ($p < 0.001$).	

Evidence of corroboration (external validity)

Evidence of salience from studies conducted in the UK

First author	Study population	Research question	Length of follow-up	Main results	Confounders/comments
Reilly et al. 2003 MAGIC (Pilot	As above.	As above.	As above.	As above.	As above.

Study) RCT Grade pending – to be confirmed on publication of full study					
Lowe et al. 2004 Food Dudes CBA 2++	Twenty-six children attending day nursery and a centre for child development aged 2–4 years took part in the study (school aged children also took part in the study, but data was analysed for 2–4-year-olds separately in a subgroup analysis).	To assess whether watching a series of six videos featuring heroic peers (the 'Food Dudes') who enjoy eating fruit and vegetables.	**Fruit consumption:** 15 months **Vegetable consumption:** 9 months	At snack-time, fruit consumption had almost doubled to 79%, and vegetable consumption had risen from 34 to 87%. At lunchtime, fruit consumption has risen from 17 to 76%, and vegetable consumption had risen from 20 to 89%.	To contact authors for further details of intervention used.
Department of Health (Sure Start) 2004 National Evaluation 2++	Sure Start represents a unique approach to early intervention for children 0–4 years, and their families, and communities. Rather than providing a specific service, the Sure Start initiative represents an effort to change existing services.	In terms of Sure Start: Do existing services change? Are delivered services improved? Do children and families and communities benefit?	Various and ongoing.	In terms of the National Evaluation, no weight, diet or PA outcomes have been reported as yet.	No results on weight, diet or PA outcomes, but the National Evaluation did assess implementation, impact, local context analysis and cost-effectiveness.
Department of Health (Reid & Adamson) 1997 Systematic review 2++	Various, but specific section in review reported on 2–5 year olds. (Some evidence considered was UK-based.)	Various. The main objectives of the review were to identify any cultural, behavioural or societal opportunities and barriers to good nutritional health which might inform policy by	Various.	1) There is evidence that children's food choices can be influenced by changing the food messages shown on television and the potential for change should make children's television an important forum for future interventions.	

		pointing to new ways of formulating or delivering interventions aimed at improving eating behaviour and improve the nutritional status in women of childbearing age, pregnant women, infants <1-year-old and children aged 1–5 years.		2) Young children do not always understand food messages in the way that they are meant, e.g. the meaning of the term 'fat'. 3) Mothers who supervise the food intake more closely may be providing an opportunity for the child to develop good nutritional behaviour.	
Evidence for implementation – Will it work in the UK?					
Dennison 2004 1+	As above.	As above.	As above.	**Providers of intervention:** One early childhood teacher and one music teacher.	As above.
He 2004 1+	As above.	As above.	As above.	Qingdao women and children's medical and healthcare centre staff.	As above.
Healthy Start 2++	As above.	As above.	As above.	**Providers of intervention:** Healthy Start instructors train the teachers and include meeting with Healthy Start nutrition educators who also conduct the parent meetings three to four times per year. School cooks and food service workers receive nutrition education training and one full-day workshop once per year and monthly on-site visits from registered dietitians on the Healthy Start Staff. Healthy Start Education Team perform direct observation of class and meal times, administer the knowledge quiz with a laptop and administer partial dietary recall by phone using direct entry computer interview. Physiological measurement taken	As above.

				by physicians, nurses, and technicians and reviewed by a paediatrician.	
Hip-Hop to Health Jr. 1+	As above.	As above.	As above.	**Providers of intervention:** The Hip Hop study is conducted within the Healthy Start programme, and use Healthy Start nutritionists and staff.	As above.
STRIP 1+	As above.	As above.	As above.	**Providers of intervention:** Nutritionist gave counselling, when children went to school, school personnel asked to help with food recording.	As above.
Worsley 2004 1+ (Systematic review)	As above.	As above.	As above.	Various.	As above.
Horodynski 2004 2–	As above.	As above.	As above.	**Providers of intervention:** Nutrition educators from Michigan State University and Early Head Start centre staff.	As above.
Koblinsky 1992 2+	As above.	As above.	As above.	**Providers of intervention:** Head Start centre staff, nutritionists and research staff.	As above.
McGarvey 2004 2+	As above.	As above.	As above.	**Providers of intervention:** WIC staff (including nutritionists) from the Virginia Department of Health and Virginia University school of medicine staff.	As above.
Reilly 2003 Grade pending – to be confirmed on publication of full study	As above.	As above.	As above.	**Providers of intervention:** Nursery staff. Evaluation of the study highlighted that the intervention was easily implemented into nurseries, enjoyed by both staff and pupils, good attendance.	As above.

2. FAMILY-BASED INTERVENTIONS TO PREVENT UNHEALTHY WEIGHT GAIN IN CHILDREN AGED 5–16 YEARS

SUMMARY

Evidence of efficacy for weight management/reduction

Evidence was identified from one systematic review that included eight relevant interventions (all RCTs in children who were at least 15% above ideal body weight (IBW) at baseline, with weight outcomes at 1 year or more, with four of these eight interventions published pre 1990) plus one RCT of two school-based interventions (Hopper 1996). Six of the studies included in the systematic review assessed different amounts and types of behaviour change therapy taught to both parent and child and all studies included in the review aimed to produce weight loss rather than prevent weight gain. Only two studies assessed behaviour change therapy given to the child alone compared with behaviour change therapy provided to both parent and child together. One of these two studies (in adolescents) showed that treating the mother and child separately appeared to be significantly more effective than treating them together, or treating the child alone. In the other study (10–11-year-old children) there was no significant difference in effect on weight outcomes between treating the parent and child together or separately.

The two school-based studies reported in the RCT (Hopper 1996) showed no significant differences between groups in post-intervention weight or skinfold thicknesses at 6 and 8 weeks follow-up. In younger children (5–12 years), five of the seven interventions reported no significant difference in weight outcomes at follow-up ranging from 1 to 5 years. One three-armed family-based RCT achieved a significant effect at 10-year follow-up. At 10-year follow-up the proportion overweight in the parent/child target group was 11.7% lower than in the child target group and 20.6% lower than in the non-specific target group. Authors also concluded that no significant differences in percent overweight changes were shown for children with one vs. two obese parents at 10-years follow-up. Another study (by the same primary author) concluded that although no significant treatment effect was observed, children with obese parents regained weight faster. One family-based intervention showed that mastery and contingency reinforcement of mastery significantly improved weight loss in obese children up to 1 year but these effects were not maintained at 2 years. There was no evidence to assess variation in effect with age or gender of children. Authors of the systematic review conclude that the studies suggest that parental involvement is associated with weight loss in children and the use of a greater range of behaviour change techniques improves weight outcomes for both parents and children. Although five of the studies showed no significant effect of intervention on weight outcomes only one of the studies did not use any parental involvement in the control group.

Evidence of efficacy for diet/physical activity outcomes

In two school-based RCTs (both reported in Hopper 1996) both treatment groups in ‘Study 1’ scored significantly higher than the control grou*p* on exercise knowledge and obtained a lower proportion of their energy from fat. In ‘Study 2’, the treatment group scored higher than the control group on post intervention fitness and nutrition knowledge as well as consuming more servings of fruit and vegetables. Within the treatment grou*p* a measure of the degree of family involvement significantly correlated with reduction in intake of fat and cholesterol.

Evidence of corroboration in the UK

No studies conducted in the UK were identified. Family based interventions are relatively labour-intensive for both providers and participants. Treating small groups of families at the same time, and using a distant component, can facilitate implementation. Generalisability from the systematic review is limited as two authors conducted five of the studies and the majority were conducted in North America.

Cost-effectiveness data

No evidence.

EVIDENCE TABLE 2: FAMILY-BASED INTERVENTIONS TO PREVENT UNHEALTHY WEIGHT GAIN IN CHILDREN AGED 5–16 YEARS

First author, Study design, Research type, research quality	**Study population**	**Research aim/question**	**Intervention details and length of follow-up**	**Main results** (include effect size(s)/CIs for each outcome if available)	**Confounders** (potential sources of bias)**/ comments**
Evidence of efficacy for weight maintenance/reduction					
McLean 2003 Systematic review 1 ++ Sixteen studies included, seven in school-age children and one in adolescents – only these results are relevant to this review and reported. Of the 8 relevant studies only 3 were published since 1990 plus a 10-year follow-u*p* of a study begun in 1979 (Epstein 1990).	Age range 6–13 years (seven studies) and 12–16 years (one study) at baseline; 70% female All children/adolescents overweight by at least 20% IBW at baseline (seven studies) and at least 15% IBW (one study). Studies sizes were small (mean *n* = 52), majority conducted in North America and concerned with weight loss; approximately 15% loss to follow-up.	To evaluate the nature and effectiveness of family-based interventions targeting food intake and/or PA, in terms of weight control, weight maintenance or weight loss. (In comparison to another type of family based intervention or non-family based component.) The aim of seven of the eight interventions considered here was weight loss, and the other's aim was weight control (Israel 1985).	Only RCTs published in English language, with at least 1-year follow-up and incorporating and family-based component were included. All eight interventions included PA plus diet. One study compared an active intervention to a waiting list control only (Israel 1985) and seven compared active interventions. The study in adolescents (Brownell 1983) and one other study (Kirschenbaum 1984) assessed behaviour change therapy given to child alone compared with behaviour change therapy provided to both parent and child together. Six studies assessed different amounts and types of behaviour change therapy taught to both parent and child. Duration of intervention ranged from 9 weeks (Kirschenbaum 1984, Israel 1985) to 2 years (Flodmark 1993) and follow-up from 1 year to 10 years (Epstein	Five of the seven interventions in school-age children found no significant difference between intervention and control at follow-up, ranging from 1 to 5 years. One three-armed family-based RCT achieved a significant effect at 10-year follow-up. At 10-year follow-up the proportion overweight in the parent/child target group was 11.7% lower than in the child target group and 20.6% lower than in the non-specific target group. One family-based intervention showed that mastery and contingency reinforcement of mastery significantly improved weight loss in obese children up to 1 year but these effects were not maintained at 2 years (Epstein 1994). Authors conclude that greater weight loss for parents and children tended to be associated with: the use of a greater range of behaviour change techniques; parent training in behaviour change techniques; and targeting parent and child together. In the study of adolescents (Brownell 1983), focusing the intervention on the mother and child separately was more effective than treating them together and treating the child alone (adolescents lost significantly more weight when treated alone).	No studies of children under age 6 years, no studies found from 1994–2000, no studies found assessing prevention of weight gain, three studies were by the same author and conducted at the same institution, another two studies were conducted by the same author and at the same institution (therefore limiting generalisability). Weight outcomes were heterogeneous

			1990). Majority studies included face-to-face sessions. Four studies included monetary deposits.	No evidence to assess variation in effect with age or gender of children.	within and between studies. The authors conclude that 'parental involvement is associated with weight loss in children' even though five of the seven interventions in school-age children found no significant differences in weight outcomes between intervention and control. However, in only one of these studies was the family-based intervention being compared with an intervention that did not involve parents at all, and, as the authors note, the subtlety of differences between

					interventions may have reduced power to detect differences in outcomes between treatment groups.
Flodmark 1993 (included in McLean 2003 systematic review) RCT with non-randomised untreated control group.	Children aged 10–11 years of age screened for obesity at school and then referred to University Hospital, Sweden if obese (BMI of at least 23 kg/m^2). Conventional treatment *n* = 19 (nine girls, ten boys); baseline BMI 25.5 (SE 0.53) kg/m^2. Family therapy *n* = 25 (14 girls, 11 boys); baseline BMI 24.7 (SE 0.36) kg/m^2. Untreated (non-randomised) control group *n* = 50.	To evaluate the effect of family therapy on childhood obesity.	Conventional treatment consisted of dietary counselling by dietitian (ten families saw dietitian once, nine families satisfied with only seeing paediatrician) and regular visits to paediatrician with interest in weight problems (seen twice during initial 6 months then every 6 months, total five visits), 1500–1700 kcal (6.28–7.11 MJ)/day, 30% from fat and encouraged to exercise. Family therapy group received same as above plus six sessions with paediatrician and psychologist spread over 1 year, family therapy focussed on family structure and how to create change through constructing solutions (de Shazer model). Control group received no treatment. Mean duration treatment 14–18 months with follow-up after another year (when children were 14 years).	At end of treatment family therapy group had significantly smaller increase in BMI compared with conventional group when expressed in percent of initial value: 0.66 vs. 2.31%, $p = 0.042$, and reduction in subscapular skinfold thickness: –16.8 vs. 6.8%, $p = 0.034$. At follow-up 1 year after end of treatment there was no significant difference between family therapy and conventional treatment groups for BMI but was significant differences between groups for skinfold thickness. Mean BMI (kg/m^2) (SE) family vs. conventional: End of treatment: 25.0 (0.53) *n* = 22 vs. 26.1 (0.72) *n* = 19, $p = 0.22$. 1 year follow-up: 25.8 (0.73) *n* = 20 vs. 27.1 (0.88) *n* = 19, $p = 0.15$ (non-random control 27.9 [0.61] *n* = 48). Median % change (range) skinfold thickness, family vs. conventional, *n* = 15 in each group. 1 year follow-up: Triceps: –7.2 (55) vs. 8.1 (133), $p = 0.027$ Subscapular: –13.2 (113) vs. 19.6 (167), $p = 0.005$ Suprailiac: –15.1 (113) vs. 30.1 (178), $p = 0.002$ 'Gender and puberty status did not contribute to variation of BMI.' Four of 19 children dropped out of conventional	Authors conclude family therapy seems to be effective in preventing progression to severe obesity during adolescence if treatment starts at 10–11 years. Intention to treat (ITT) – school nurses obtained measurements in children who dropped out.

	Baseline BMI 25.1 (SE 0.35) kg/m^2. Twenty children had one obese parent and 13 had two; 17 children had no siblings and 11 had at least one sibling – no significant differences between groups.			treatment. Nine of 24 children (one pilot case excluded from analysis) dropped out of family therapy group.	
Epstein 1981, 1987, 1987, 1990 (included in McLean 2003 systematic review) RCT	Seventy-six families with obese 6–12–year-olds with at least one obese parent, selected from population who applied to enter study (obese defined as >20% IBW). Socio-economic status (SES) of parents equal to medium-sized business owners, minor professionals and technical workers; 53 of 55 families	To test the hypothesis that treatments that target and reinforce habit change and weight loss in obese parents and children together will be superior over 10 years to treatments that focus on child habit and weight change independent of parent success or to a control treatment that targets and reinforces the family members for attendance only.	All three groups received similar diet, exercise and behaviour management training and differed only in the reinforcement for behaviour change and weight loss. Traffic-light diet limiting sweets and sugared beverages, 1200–1500 kcal (5.02–6.27 MJ)/day limit, daily minimum of two servings high protein foods, two servings dairy foods, four servings grains, four servings fruit and vegetables; instructed to begin an exercise programme (Cooper aerobic point system); parent + child and child target groups received self-monitoring and social reinforcement training, money deposited was returned only if parent and child lost weight in parent + child target group and if child only lost weight in child	Change in % overweight at 5 years in parent + child vs. child vs. non-specific groups (SD or SE not reported): –12.7% (*n* = 24) vs. 4.3% (*n* = 21) vs. 8.2% (*n* = 16). Change in % overweight at 10 years in parent + child vs. child vs. non-specific groups: –7.0% (*n* = 20) vs. 4.7% (*n* = 16) vs. 13.6% (*n* = 19). 'No significant differences in percent overweight changes were shown for children with one vs. two obese parents.' Change in weight gain at 10 years in parent + child vs. child vs. non-specific groups: 34.0 kg (*n* = 20) vs. 43.1 kg (*n* = 16) vs. 46.6 kg (*n* = 19); children in child and non-specific groups were significantly heavier than children in parent + child group ($p < 0.05$). No significant difference in percent overweight in *parents* at 10 years in parent + child vs. child vs. non-specific groups: 9.1% (13.9) vs. 4.6% (10.1) vs. 10.6% (13.4).	First long-term study to show that behavioural family-based treatment began between ages 6 to 12 years can have persistent and positive effect on weight through into young adulthood; the importance of targeting and reinforcing only the child vs. the child + parent or only the child vs. non-specific

	were white. Child and parent target group mean age 9.4 (1.8) years, male/female 14/6, weight 47.2 (12.7) kg. Child target mean age 10.4 (1.2) years, male/female 9/7, weight 54.9 (12.6) kg. Non-specific control mean age 9.9 (2.3) years, male/female 13/6, weight 53.2 (13.7) kg.		target group; non-specific target group had money returned on attendance regardless of weight lost and received education on diet through standard lecture-style format. All groups received eight × weekly meetings then six additional meetings in next 6 months, then at 21, 60 and 120-month follow-up meetings.	Effect of study also assessed on non-treated parents and siblings (Epstein 1987) – overweight non-participating siblings of children in the parent + child target group had significantly greater percent overweight change at 5 years than overweight siblings in the child alone target and non-specific target groups (–7.0 [14.6] vs. 4.1% [10.4]). No significant group differences were observed for obese non-participating parents or non-obese non-participating siblings or parents (based on participating parent report).	target cannot be inferred. Study also showed that weight regulation had no effect on height. Outcome results differ in abstract compared with text of study paper (Epstein 1990).
Brownell 1983; (included in McLean 2003 systematic review) RCT	12–16 years, 79% female, at least 20% above IBW, attended with mothers, *n* = 42 in total.	To evaluate any difference in effectiveness between treating adolescents alone, separately from mothers and together with mothers on weight.	Mother and child seen together vs. mother and child seen separately vs. child alone; aim of all three interventions were change in target behaviour of child, mother gave active support in mother and child seen together and mother and child seen separately groups; mother gave passive support in child alone group. Intervention included target setting, monitoring, contingencies, increasing skills, prompts/triggers/cues, social	At 1-year follow-up change in weight, mother-child separately vs. mother-child together vs. child alone: –7.7 (14.2) vs. 2.9 (7.3) vs. 3.2 (5.9) kg. *n* = 42 in total. At 1-year follow-up change in % overweight, mother–child separately vs. mother–child together vs. child alone: –20.5% (22.5) vs. –5.5% (12.1) vs. –6.0% (13.2). *n* = 42 in total. ‘Adolescents targeted separately from their mothers lost significantly more weight than when	

			support, information regarding behaviour and outcome. 16-week intervention with follow-up at 1 year.	targeted with their mothers.'	
Epstein 1986, 1987 (included in McLean 2003 systematic review) RCT	Forty-one families with 8–12-year-old children between 20–80% over IBW (24 children had at least one obese parent)	To investigate the role of parent weight (obese/non-obese) and parent control vs. child self-control on eight loss in obese preadolescent children >3 years old.	Parent control group and child self-control group, US$85 deposit returned on attendance; children and overweight parents given 1200 kcal (5.01 MJ) diet and lifestyle exercise programme, non-obese parents given weight maintenance diet and same exercise programme; children in both groups earned points backed up by privilege and activity reinforcers that were sued to regulate child eating and exercise habits; initially determination of when goals were met were made by therapist this then changed to parents (parent control group) or children (child self-control group). Eight × weekly meetings and ten × monthly meetings in which parent and child seen separately over 1-year period, 3-year data available for 38 families, 5-year follow-up for 33 families.	Parent or child self-control had no significant effect on weight change: change in % overweight, parent control vs. child self-control: 6 months: –17.4 vs. –14.7% (*n* = 38 families in total) 1 year: –12.4 vs. –11.7% (*n* = 38 families in total) 3 years: –5.7 vs. 0.1% (*n* = 38 families in total) 5 years: –3.6 vs. 3.3% (*n* = 33 families in total) Change in % overweight between children of non-obese parents vs. children of obese parents: 6 months: –17.2 vs. –14.3% (*n* = 38 families in total) 1 year: –16.3 vs. –7.7%, $p < 0.01$ (*n* = 38 families in total) 3 years: –5.6 vs. –0.9% (*n* = 38 families in total) 5 years: 10.7% lower in children of non-obese parents vs. children of obese parents ($p = 0.044$, *n* = 33 families in total). Children with non-obese parents were more compliant for energy limit and had better eating behaviour. 'No significant treatment effect was observed but children with obese parents regained weight faster and so parent weight may influence long-term outcome of child weight.'	Authors evaluated effect of parent weight on weight outcomes but parent weight was crossed with treatment condition. Change in percentage overweight between children with obese/non-obese parents differs in two papers but pattern is same (one paper adjusted results for difference in baseline initial percent overweight between parent weight groups).
Epstein 1994 (included in McLean 2003 systematic review)	Forty-four families with obese (20–80% above IBW) 8–12-year-old	To evaluate the effects of mastery criteria and contingent reinforcement for	All subjects had same information regarding self-monitoring, diet (traffic light diet with energy intake goals ranging from 900–1800 kcal (3.77–7.53 MJ) on level 1 to 900–	Changes in % overweight experimental group (*n* = 17 children) vs. control (*n* = 22 children): 6 months: –30.1 vs. –20.0%, $p < 0.05$ 1 year: –26.5 vs. –16.7%, $p < 0.05$ 2 years: –15.4 vs. –10.6%, $p = 0.29$	

RCT	children, mean age 10.2 (1.1) years, 59.6 (22.0)% over 50th percentile for BMI, 74% female; 82% parents were mothers, 54% participating parents were obese and 30.1 (20.9)% participating parents were over 50th percentile for BMI, majority middle class SES status.	family-based behavioural treatment of childhood obesity.	1200 kcal (3.77–5.02 MJ) by level 4 and individually adjusted energy intake control on level 5 based on maintenance requirements) and exercise (lifestyle exercise programme) and both treatments included behaviour management (focussing on praise and stimulus control, also included quizzes, contracting and lottery tickets) and parenting education. In experimental group families progressed through treatment at own rate based on mastery of information and skills and were reinforced on individual basis; control group were 'yoked' to progress in treatment group and did not have to demonstrate mastery of behaviour change skills. Twenty-six × weekly meetings and 6 monthly meetings up to 2 years.	Mastery and contingency reinforcement of mastery can significantly improve weight loss in obese children up to 1 year but these effects were not maintained at 2 years.	
Israel 1985 (included in McLean 2003 systematic review) RCT	Thirty-three families, children aged between 8–12 years and at least 20% over IBW; mean age 11 years and 4 months. Behavioural weight reduction only group, *n* = 12 (nine girls,	To evaluate the effect of explicit and additional training in general child management skills in the context of a behavioural treatment programme for overweight children.	Behavioural weight reduction only group and behavioural weight reduction plus parent training group received identical treatment consisting of stimulus control cues, exercise, food intake and rewards; responsibility for monitoring was divided between parent and child, also included homework. Behavioural weight reduction plus parent training group also received 2-hour-long sessions of instruction in behavioural child	Changes in weight at 1-year behavioural weight reduction plus parent training vs. behavioural weight reduction only: 5.2 (*n* = 11) vs. 4.8 kg (*n* = 9). Change in % overweight at 1 year behavioural weight reduction plus parent training vs. behavioural weight reduction only: –10.2 (*n* = 11) % vs. –1.3% (*n* = 9). No significant difference between two active treatment groups.	

	three boys, range 9–12 years). Behavioural weight reduction plus parent training group, *n* = 12 (eight girls, four boys, range 8–13 years). Wait list control group, *n* = 9 (six girls, three boys, range 9–12 years).		management skills prior to start of programme, understanding was tested in three quizzes and concepts were referred to in treatment programme. Nine × 90 min sessions then brief problem-solving discussions at 1, 2, 4, 6, 9 and 12 months including telephone calls.		
Israel 1994 (included in McLean 2003 systematic review) RCT	Thirty-four children aged 8–13 years and at least 20% over IBW; mean age 10 years 11 months (SD 1 year 2 months).	To evaluate the effect of enhanced self-regulation in the treatment of childhood obesity.	Both treatment groups consisted of stimulus control cues, exercise, food intake and rewards; instruction in general child management principles, families monitored children's food intake and parents rewarded appropriate behaviours. Enhanced child involvement group placed less emphasis on parental control and children trained in self-goal setting, formulating and implementing behaviour change, self-evaluation, self-reward and training for high-risk situations, parents also rewarded children for engaging in self-management skills. Groups of five to seven families, eight × weekly 90-min parent and child sessions held separately followed by 9 × biweekly sessions	26/34 families completed 26 weeks, 20/34 families completed 1- and 3-year follow-up (no difference between groups). Change in % overweight standard treatment vs. enhanced child involvement: 1 year: –0.7 (*n* = 11) vs. –5.8% (*n* = 9) 3 years: 6.4 (*n* = 11) vs. –4.8% (*n* = 9) No significant difference between treatment groups.	

			for 26 weeks, follow-up at 1-year and 3-years post-treatment.		
Kirschenbaum 1984 (included in McLean 2003 systematic review) RCT	Forty parent–child dyads where child aged 9–13 years and at least 20% above IBW and parent at least 10% above IBW. Parent + child group *n* = 16 (mean age 10.4, *n* = 13). Child only group, *n* = 15 (mean age 11.2, *n* = 9). Non-randomised control group, *n* = 9.	To evaluate the effects of parental involvement and family environment on weight loss on obese preadolescents.	Both treatment groups received cognitive-behavioural treatment including self-monitoring, increasing exercise, nutrition education, stimulus control, meal and exercise planning, self-reward, decelerated eating, coping techniques. Parent + child group attended all sessions together. Child only group children only attended sessions and had to bring in parent's homework and emphasis on child becoming the expert. Waiting list control dyads attended assessments only. Nine × weekly sessions plus 3-month and 1-year follow-up sessions; US $30 fee plus $50 deposit refunded contingent on attendances.	Change in % overweight at 1 year, parent + child vs. child only: –7.6% (*n* = 13) vs. –6.2% (*n* = 9). Change in weight at 1 year, parent + child vs. child only: –3.2 kg (*n* = 13) vs. –2.8 kg (*n* = 9). Children in both active treatment groups lost and sustained weight loss over 1 year with no significant difference in effect between the two groups.	Significant difference in treatment dropout between two active interventions groups (voluntary dropout 33% in child only group*p* vs. % in parent +child group, $p < 0.03$, with three of five cases stating parent dissatisfaction at being assigned child only group).
Hopper 1996 RCT (cluster, by class) 1+	**Study 1:** 132 school children, mean age 11.6 (SD 0.7) years plus a participating parent for 42 of the 45 children in the school-and-home treatment condition.	**Study 1:** To assess the effectiveness of including a family participation component in a 6-week school-based programme to develop children's heart-healthy exercise and nutrition habits.	**Study 1:** School-and-home and school-only groups received nutrition education two × half-hour in school sessions per week for 6 weeks; emphasising different meals and targets for behaviour change, focus on reducing saturated fat and heart-healthy foods. Three × 40 min in-school sessions per week for 6-weeks	**Studies 1 and 2:** No significant differences between groups in post-intervention weight or skinfold thickness.	Lack of follow-up is a major weakness of the study. Family was defined as at least one adult and one child sharing usual household activities.

	Study 2: ninety-seven school children, mean age 8.9 (SD 1.18) years, plus a participating parent of each child in the treatment condition.	(School-and-home treatment condition *n* = 45 vs. school-only treatment condition *n* = 43 vs. control condition *n* = 44.) **Study 2:** To assess the effectiveness of a 10-week school-based fitness and nutrition programme with parent involvement. (School-based treatment with parent participation treatment condition *n* = 48 vs. control condition *n* = 49.) Outcomes in the same classes as above.	instruction in physical fitness particularly aerobic exercise. In addition the school-and-home group received weekly homework packs and received points for completing nutrition and exercise activities. Control group received no additional instruction in nutrition and exercise from school curriculum. Length of intervention was 6 weeks. **Study 2:** School-and-home and school-only groups received nutrition education two × half-hour in school sessions per week for 10 weeks; emphasising different meals and targets for behaviour change, focus on reducing saturated fat and heart-healthy foods. In addition the school-and-home group received weekly homework packs and received points for completing nutrition and exercise activities. Four × 30 min in-school sessions per week for 10 weeks instruction in physical fitness particularly aerobic exercise. Control group received no additional instruction in nutrition		

			and exercise from school curriculum. Length of intervention was 10 weeks.		
Evidence of efficacy (internal validity) for diet/physical activity outcomes					
McLean 2003	As above.	As above.	As above.	Not reported	As above.
Hopper 1996	As above.	As above.	As above.	**Study 1:** The school-and-home group scored significantly higher than the control group on post-intervention nutrition knowledge and sit-and-reach flexibility. There was no significant difference between the school-only and control groups. Both treatment groups scored significantly higher than the control group on exercise knowledge and both obtained a smaller proportion of their energy from fat. There were no significant between-group differences in any other measures of dietary intake (grams of protein, carbohydrates or fat, and % energy from protein or carbohydrates) or other performance measures (number of sit-ups in a minute, time to run one mile). **Study 2:** The treatment group scored higher than the control group on post-intervention measures of fitness/nutrition knowledge, and consumption of servings of fruit and vegetables. There were no significant between-group differences in any other post-intervention scores, i.e. any other measures of dietary intake and time to run a mile. Within the treatment group, a measure of the degree of family involvement significantly correlated with reduction in intake of fat and cholesterol but no other change scores.	As above.
Evidence of corroboration (external validity)					

Evidence of salience – Is it appropriate for the UK?					
First author, study design, research type and quality	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/ comments**
McLean 2003 Systematic review 1++	As above.	As above.	As above.	**Country:** Children: Six interventions in USA, one in Sweden. Adolescents: one intervention in USA. Should be generalisable to the UK.	Sample sizes were small, so intervention may have been unable to detect an effect if one existed.
Hopper 1996 RCT 1+	As above.	As above.	As above.	**Country:** USA, so probably generalisable to the UK.	Sample sizes were small, so intervention may have been unable to detect an effect if one existed.
Evidence for implementation – Will it work in the UK?					
First author, study design, research type and quality	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/ comments**
McLean 2003 Systematic review 1++	As above.	As above.	As above.	The family-based interventions were relatively labour-intensive for both providers of the interventions and participants. Families were treated in small groups or individually (though providers of the interventions were mostly not stated in the systematic review), and most interventions had a distant learning component (in the form of assignments and educational materials).	The median dropout rate during the interventions was 18 (range 11–33)%, but not reported for three of the interventions).
Hopper 1996	As above.	As above.	As above.	**Study 1:** The school component involved: (1) physical	

RCT 1+				fitness education: three 40-minute, in-school sessions per week for 6 weeks; (2) nutrition education: two 30 min, in-school sessions per week for 6 weeks. The home component involved weekly packets (containing information and activities) for children to take home and read with their families, with information, and a scorecard to complete. Families were also given reinforcers (stickers, t-shirt, certificates, etc.). Teachers and staff from the State Department of Health and Physical Education delivered the intervention. **Study 2:** The school component was similar to Study 1 except 10 weeks in duration. Home component: as above. Delivery as above.	

SEARCH STRATEGIES

1. exp OBESITY/
2. exp Weight Gain/
3. exp Weight Loss/
4. obes$.ti,ab.
5. (weight gain or weight loss).ti,ab.
6. (overweight or over weight or overeat$ or over eat$).ti,ab.
7. weight change$.ti,ab.
8. ((bmi or body mass index) adj2 (gain or loss or change)).ti,ab.
9. body mass.ti,ab.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. exp Behavior Therapy/
12. exp Social Support/
13. exp Family Therapy/
14. exp Psychotherapy, Group/
15. ((psychological or behavio?r$) adj (therapy or modif$ or strateg$ or intervention$)).ti,ab.
16. (group therapy or family therapy or cognitive therapy).ti,ab.
17. ((lifestyle or life style) adj (chang$ or intervention$)).ti,ab.
18. counsel?ing.ti,ab.
19. social support.ti,ab.
20. (peer adj2 support).ti,ab.
21. (children adj3 parent$ adj therapy).ti,ab.
22. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
23. exp OBESITY/dh [Diet Therapy]
24. exp Diet, Fat-Restricted/
25. exp Diet, Reducing/
26. exp Diet Therapy/
27. exp FASTING/
28. diet$.ti,ab.
29. (low calorie or calorie control$ or healthy eating).ti,ab.
30. (fasting or modified fast$).ti,ab.
31. exp Dietary Fats/
32. (fruit or vegetable$).ti,ab.
33. (high fat$ or low fat$ or fatty food$).ti,ab.
34. formula diet$.ti,ab.
35. 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
36. exp EXERCISE/
37. exp Exercise Therapy/
38. □uantita$.ti,ab.
39. (fitness adj (class$ or regime$ or program$)).ti,ab.
40. (aerobics or physical therapy or physical training or physical education or physical activity or physical inactivity).ti,ab.
41. dance therapy.ti,ab.
42. sedentary behavio?r.ti,ab.
43. 36 or 37 or 38 or 39 or 40 or 41 or 42
44. exp Complementary Therapies/
45. (alternative medicine or complementary therap$ or complementary medicine).ti,ab.
46. (hypnotism or hypnosis or hypnotherapy).ti,ab.
47. (acupuncture or homeopathy or homoeopathy).ti,ab.
48. (□uantit medicine or □uanti medicine or herbal medicine or ayurvedic).ti,ab.
49. 44 or 45 or 46 or 47 or 48
50. ((diet or dieting or slim$) adj (club$ or organi?ation)).ti,ab.
51. (weightwatcher$ or weight watcher$).ti,ab.
52. (correspondence adj (course$ or program$)).ti,ab.
53. (fat camp$ or diet$ camp$).ti,ab.
54. 50 or 51 or 52 or 53
55. exp Health Promotion/
56. exp Health Education/
57. (health promotion or health education).ti,ab.

58. (media intervention$ or community intervention$).ti,ab.
59. health promoting school$.ti,ab.
60. ((school or community) adj2 program$).ti,ab.
61. (family intervention$ or parent$ intervention).ti,ab.
62. (parent$ adj2 (behavio?r or involve$ or control$ or attitude$ or educat$)).ti,ab.
63. 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62
64. exp Health Policy/
65. exp Nutrition Policy/
66. (health polic$ or school polic$ or food polic$ or nutrition polic$).ti,ab.
67. 64 or 65 or 66
68. exp OBESITY/pc [Prevention & Control]
69. exp Primary Prevention/
70. (primary prevention or secondary prevention).ti,ab.
71. (preventive measure$ or preventative measure$).ti,ab.
72. (preventive care or preventative care).ti,ab.
73. (obesity adj2 (prevent$ or treat$)).ti,ab.
74. 68 or 69 or 70 or 71 or 72 or 73
75. exp Controlled Clinical Trials/
76. exp Random Allocation/
77. exp Double-Blind Method/
78. exp Single-Blind Method/
79. exp PLACEBOS/
80. exp *Research Design/
81. exp Intervention studies/
82. exp Evaluation studies/
83. exp Cost Benefit Analysis/
84. (time adj series).tw.
85. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask)).ti,ab.
86. exact{CONTROLLED-CLINICAL-TRIAL}.pt.
87. placebo$.ti,ab.
88. (matched communities or matched schools or matched populations).ti,ab.
89. (control$ adj (trial$ or stud$ or evaluation$ or experiment$)).ti,ab.
90. (comparison group$ or control group$).ti,ab.
91. matched pairs.ti,ab.
92. (outcome study or outcome studies).ti,ab.
93. (quasiexperimental or quasi experimental or pseudo experimental).ti,ab.
94. (nonrandomi?ed or non randomi?ed or pseudo randomi?sed).ti,ab.
95. randomi?ed.hw.
96. (cohort or survey: or qualitative).ti,ab.
97. 75 or 76 or 77 or 78 or 79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96
98. exp Meta-Analysis/
99. meta-analys$.ti,ab.
100. metaanalys$.ab,ti.
101. meta analys$.ab,ti.
102. Cochrane.ab,sh,ti.
103. (review$ or overview$).ti.
104. review$.pt.
105. (synthes$ adj3 (literature$ or research or studies or data)).ab,ti.
106. pooled analys$.ab,ti.
107. ((data adj2 pool$) and studies).mp. [mp=title, original title, abstract, name of substance, mesh subject heading]
108. ((hand or manual or database$ or computer$) adj2 search$).ab,ti.
109. ((electronic or bibliographic$) adj2 (database$ or data base$)).ab,ti.
110. ((review$ or overview$) adj10 (systematic$ or methodologic$ or □uantitative$ or research$ or literature$ or studies or trial$ or effective$)).ab.
111. 98 or 99 or 100 or 101 or 102 or 103 or 104 or 105 or 106 or 107 or 108 or 109 or 110
112. (retrospective$ adj2 review$).ab,sh,ti.
113. (case$ adj2 review$).ab,sh,ti.
114. (record$ adj2 review$).ab,sh,ti.
115. (patient$ adj2 review$).ab,sh,ti.
116. (patient$ adj2 chart$).ab,sh,ti.
117. (peer adj2 review$).ab,sh,ti.

118. (chart$ adj2 review$).ab,sh,ti.
119. (case$ adj2 report$).ab,sh,ti.
120. (rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep).ab,sh,ti.
121. 112 or 113 or 114 or 115 or 116 or 117 or 118 or 119 or 120
122. 121 not (121 and 111)
123. 111 not 122
124. 22 or 35 or 43 or 49 or 54 or 63 or 67 or 74
125. 10 and 124 and 97
126. 10 and 124 and 123
127. 125 or 126
128. animal/
129. human/
130. 128 not (128 and 129)
131. 127 not 130
132. limit 131 to yr=1990–2004
133. exp CHILD/
134. exp ADOLESCENT/
135. exp INFANT/
136. (child$ or adolescent$ or infant$).af.
137. (teenage$ or young people or young person or young adult$).af.
138. (schoolchildren or school children).af.
139. (pediatr$ or paediatr$).af.
140. (boys or girls or youth or youths).af.
141. 133 or 134 or 135 or 136 or 137 or 138 or 139 or 140
142. 132 and 141

DATA SOURCES

The following information sources were searched:

AMED
ASSIA
British Nursing Index
CAB Abstracts
CENTRAL (Cochrane Controlled Trials Register)
CINAHL
Clinical Evidence – http://www.clinicalevidence.org
Cochrane Database of Systematic Reviews
CRD (EED database) http://www.york.ac.uk/inst/crd
DARE
Embase
EPPI-Centre – http://eppi.ioe.ac.uk/
ERIC
Food Standards Agency – http://www.food.gov.uk/science/research/
HAD Evidence Base – http://www.hda-online.org.uk/html/research/effectiveness.html
Health Evidence Bulletins – Wales – http://hebw.cf.ac.uk
HealthPromis
IUHPE (International Union for Health Promotion and Education) – http://www.iuhpe.nyu.edu/pubs/index.html
Medline
NCCHTA – http://www.ncchta.org
NICE – www.nice.org.uk
Public Health Effectiveness (Hamilton, Ontario) -
http://www.health.hamilton-went.on.ca/CSCARB/EPHPP/ephpp.htm
PsycINFO
SIGN – http://www.sign.ac.uk
Social Science Citation Index (equiv. to Current Contents)
Sociological Abstracts
Sport Discus

The electronic search strategies (Appendix 1) were developed in Medline and adapted for use with the other information sources.

EXCLUDED REFERENCES

Excluded individual studies	Reason for exclusion
Anderson JV, Bybee DI, Brown RM, McLean DF, Garcia EM, Breer ML, Schillo B. 5 A Day fruit and vegetable intervention improves consumption in a low income population. *Journal of the American Dietetic Association* 2001;101(2):195-202.	Only parental outcomes reported.
Anliker JA, Laus MJ, Samonds KW, Beal VA. Parental messages and the nutrition awareness of preschool children. *Journal of Nutrition Education* 1990:22(1):24–9.	Not an intervention study.
Division of Health Examination Statistics: National Centre for Chronic Disease prevention and Health promotion Nutrition Status of Children Participating in the Special Supplemental Nutrition Program for Women, Infants, and Children – United States, 1988–1991. *Morbidity and Mortality Weekly Reports* 1996;45(3).	No outcome data reported.
Bauer C, Rosemeier A A Handicap for Life – Overweight and obesity in pre-school children in Karlsruhe. Gesundheitwesen 2004;66:246-250.	Foreign language.
Baughcum AE, Chamberlin L A, Deeks CM, Powers SW, Whitaker RC. Maternal Perceptions of Overweight Preschool Children. ProQuest Nursing Journal. *Paediatrics* 2000;106(6):1380.	No control and cross-sectional study.
Bautista-Castano I, Doreste J, Serra-Majem L. Effectiveness of interventions in the prevention of childhood obesity. *European Journal of Epidemiology* 2004;19,617–22.	Studies are school-aged/based.
Benton D. Role of parents in the determination of the food preferences of children and the development of obesity. *International Journal of Obesity* 2004;28:858–69.	Not an intervention study.
Birmingham B, Armstrong-Shultz J, Edlefsen M. Evaluation of a Five-A-Day Recipe Booklet for Enhancing the Use of Fruits and Vegetables in Low-Income Households. *Journal of Community Health* 2004;29(1):45-62.	Not an intervention study.
Borzekowski DLG, Robinson TN. The 30-second effect: An experiment revealing the impact of television commercials on food preferences of preschoolers. *Journal of the American Dietetic Association* 2001;101(1)**:**42-46.	Due to short duration.
Burdette HL, Whitaker RC. Neighbourhood playgrounds, fast food restaurants, and crime: relationships to overweight in low-income preschool children. *Preventive Medicine* 2004;38:57–63.	Not an intervention study.
Byrd-Bredbenner C, Marecic MFL, Bernstein J. Development of a Nutrition Education Curriculum for Head Start Children. *Journal of Nutrition Education* 1993;25(3)**:**134-139.	No outcome data reported.
Caballero B, Clay T, Davis SM, Ethelbah B, Rock BH, Lohman JN, Story M, Stone EJ, Stephenson L, Stevens J. Pathways: a school-based, randomized controlled trial for the prevention of obesity in American Indian schoolchildren. *American Journal of Clinical Nutrition* 2003;78:1030–8.	In school children.
Chomitz VR, Collins J, Kim J, Kramer E, McGowan R. Promoting Healthy Weight among elementary school children via a health report card approach. *Archives of Paediatrics and Adolescent Medicine* 2003;157(8): 765-772.	Children were of school age (primary).
Cody R, Lee C. Development and evaluation of a pilot program to promote exercise among mothers of preschool children. *International Journal of Behavioural Medicine* 1999;6(1):13–29.	Not an intervention study and no direct relevance to implementation in the UK settings.
Cooke LJ, Wardle J, Gibson EL, Sapochnik M, Sheiham A, Lawson M. Demographic, Familial and trait predictors of fruit and vegetable consumption by pre-school children. *Public Health Nutrition* 2003;7(2):295–302.	Not an intervention study.
Crawford PB, Gosliner W, Strode P, Samuels SE. Walking the talk: fit WIC wellness programs improve self-efficacy in pediatric obesity prevention counseling. *American Journal of Public Health* 2004;94(9):1489.	Not clear if intervention study.
Davies PSW. Diet composition and body mass index in pre-school children. *European Journal of Clinical Nutrition* 1997;51:443–8.	Not an intervention study.
Davis K, Christoffel KK. Obesity in pre-school and school-age children.	Paper is on treatment of

Treatment early and often may be best. *Archives of Pediatric and Adolescence Medicine* 1994;148:1257.	obese children, not prevention.
Dennison BA, Rockwell HL, Baker SL. Excess fruit juice consumption by pre-school aged children is associated with short stature and obesity. *Pediatrics* 1997;99(1):15-22.	Not an intervention study.
Dennison BA, Erb TA, Jenkins PL. Television viewing and television in bedroom associated with overweight risk among low-income pre-school children. *Pediatrics* 2002;109(6):1028.	Not an intervention study. No control and cross-sectional survey.
Dorosty AR, Emmett PM, Cowin IS, Reilly JJ, ALSPAC Study Team. Factors associated with early adiposity rebound. *Pediatrics* 2002;105(5): 1115.	Not an intervention study. No control and longitudinal cohort study.
Epstein LH, Valoski A, McCurley J. Effect of weight loss by obese children on long-term growth. *American Journal of Diseases in Childhood* 1993;47:1076.	Not an intervention study. No corroborative evidence.
Epstein LH, Coleman KJ, Myers MD (1996). Exercise in treating obesity in children and adolescents. *Medicine and Science in Sports and Exercise* 1996;28(4);428–45.	Age of children (6–15 years) and treatment of obesity.
Fahrenwald NL, Sharma J. Development and expert evaluation of 'Moms on the Move', a physical activity intervention for WIC mothers. *Public Health Nursing* 2002;19(6):423–39.	Not an intervention study. Does not provide corroborative/economic evidence of direct relevance.
Ford RM, Evans D, McDougall JP. Progressing in Tandem: A Sure Start initiative for enhancing the role of parents in children's early education. *Education and Child Psychology* 2003;20(4):80-95.	Not an intervention study.
Goran MI, Reynolds KD, Lindquist CH. Role of physical activity in the prevention of obesity in children. *International Journal of Obesity* 1999;23 (Suppl 3):S18–33.	Not an intervention study .
Harrell JS, Gansky SA, McMurray RG, Bangdiwala SI, Frauman AC, Bradley CB. School-based interventions improve heat health in children with multiple cardiovascular disease risk factors. *Pediatrics* 1998;102(2):371.	Study in school children.
He Q, Ding ZY, Fong DYT, Karlberg J. Risk factors of obesity in preschool children in China: a population-based case–control study. *International Journal of Obesity* 2000;24:1528–36.	Nationwide case study in China – not an intervention study
Hendy HM, Raudenbush B. Effectiveness of teacher modelling to encourage food acceptance in preschool children. *Appetite* 2000;34:61–76.	Not an intervention study.
Hindin TJ, Contento IS, Gussow JD. A media literacy nutrition education curriculum for head start parents about the effects of television advertising on their children's food requests. *Journal of the American Dietetic Association* 2004;104(2):192-198.	No outcome data available.
Horne PJ, Tapper K, Lowe CF, Hardman CA, Jackson MC, Woolner J. Increasing children's fruit and vegetable consumption: a peer-modelling and rewards-based intervention. *European Journal of Clinical Nutrition* 2004;58:1649–60.	Study on 5–7-year-olds.
Jackson DM, Reilly JJ, Kelly LA, Montgomery C, Grant S, Paton JY. Objectively measured physical activity in a representative sample of 3 to 4 year old children. *Obesity Research* 2003;11(3):420.	Not an intervention study.
Jackson DM, Grant S, Paton JY, Reilly JJ. Correlates of physical activity in Scottish pre-school children prior to the adiposity rebound. *Obesity Research 2000*;8 (Suppl.1): 018.	Not an intervention study. Abstract only.
James J, Brown J, Douglas M, Cox J, Stocker S. Improving the diet of under fives in a deprived inner city practice. *Health Trends* 1992:24(4):160-164.	Not an intervention study, also not controlled.
Jin, J., Wang, Y., Pei, Y., Lu, H., Le, L. Analysis of the physical fitness status of pre-school children aged 3-6 years in Beijing. Sports science (Beijing) 1998;18(4):46-48.	Needs translating/not english language
Klesges RC, Stein RJ, Eck LH, Isbell TR, Klesges LM. Parental influence on food selection in young children and its relationships to childhood obesity. *American Journal of Clinical Nutrition* 1991;53:859–64.	Not an intervention as such – intervention in mothers influence on eating. Also study done 1991.

Kranz S, Siega-Ritz AM, Herring AH. Changes in diet quality of American preschoolers between 1977 and 1998. *American Journal of Public Health* 2004;94(9):1525.	Not an intervention study.
Lagstrom H, Niinikoski H, Lapinleimu H, Viikari J, Ronnemaa T, Simell O. Modifying coronary heart disease risk factors in children: is it ever too early to start? *Journal of the American Medical Association* 1998;279(16):1261–12.	No outcome data available
Lawatsch DE. A comparison of two teaching strategies on nutrition knowledge, attitudes and food behaviour of pre-school children. *Society for Nutrition Education* 1990;22:117–23.	Due to short duration.
Leonard CP, D'Augelli AR, Smickiklas-Wright H. Effects of a weight-control promotion programme on parents responses to family eating situations. *Journal of the American Dietetic Association Research* 1984;84(4):424–27.	Does not provide corroborative/economic evidence of direct relevance.
Levine B. Childhood obesity associated with the excessive consumption of soft drinks and fruit juices. *Clinical Nutrition* 1997;13(1):69–73.	Not an intervention study.
Lomperis AMT. Teaching mothers to read: evidence from Colombia on the key role of maternal education in preschool child nutritional health. *Journal of Developing Areas* 1991;26:25–52.	Not an intervention study.
Luo J, Hu FB. Time trends of obesity in pre-school children in China from 1989 to 1997. *International Journal of Obesity* 2002;26:553–8.	Cross Sectional and Longitudinal analysis.
Manios Y, Katatos A, Mamalakis G. The effects of a health education intervention initiated at first grade over a 3 year period: physical activity and fitness indices. *Health Education Research* 1998;13(4):593–606.	Not preschool children.
McConahy KL, Smicklas-Wright H, Mitchell DC, Picciano MF. Portion size of common foods predicts energy intake among preschool-aged children. *Journal of the American Dietetic Association* 2004;104:975–9.	Not an intervention study.
Montgomery C, Reilly JJ, Jackson DM, Kelly LA, Slater C, Paton JY, Grant S. Relation between physical activity and energy expenditure in a representative sample of young children. *American Journal of Clinical Nutrition* 2004;80:591–6.	Not an intervention study.
Mo-Suwan L, Pongprapai S, Junjana C, Putetpaiboon A. Effects of a controlled trial of a school-based exercise program on the obesity indexes of preschool children. *American Journal of Clinical Nutrition* 1998;68:1006–11.	Not preschool children.
Myers S, Vargas Z . Parental perceptions of the preschool obese child. *Pediatric Nursing* 2000;26(1):23.	This is a cross-sectional survey of what parents think about their child's weight and food intake.
Newby PK, Peterson KE, Berkey CS, Leppert J, Willett WC, Colditz GA. Dietary composition and weight change among low-income preschool children. *Archives of Pediatrics and Adolescent Medicine* 2003;157(8):759.	Not an intervention study.
Pate RR, Pfeiffer KA, Trost SG, Ziegler P, Dowda M. Physical activity among children attending preschools. *Pediatrics* 2004;114(5):1258-1263.	Not an intervention study. Short duration.
Perry CL, Bishop DB, Taylor GL, Davis M, Story M, Gray C et al. A Randomized school trial of environmental strategies to encourage fruit and vegetable consumption among children. *Health Education and Behaviour* 2004;31(1):65–76 .	Study does not provide corroborative/economic evidence of direct relevance.
Pienaar AE, Badenhorst, P. Physical activity levels and play preferences of pre-school children: recommendations for appropriate activities. *Journal of Human Movement Studies* 2001;41105–23.	Not an intervention study. Not control or comparison study. Duration.
Proctor MH, Moore LL, Gao D, Cupples LA, Bradlee ML, Hood MY, Ellison RC. Television viewing and change in body fat from preschool to early adolescence: The Framingham Children's Study. *International Journal of Obesity* 2003;27:827–33.	Not a controlled study.
Ray R, Lim LH, Ling SL. Obesity in preschool children: an intervention programme in primary health care in Singapore. Annals Academy of Medicine Singapore 1994;23: 335-341.	Not an intervention study.
Robinson TA. Reducing children's television viewing to prevent obesity. *Journal of the American Medical Association* 1999;282(16):1561.	Doesn't provide corroborative/economic

	evidence of direct relevance to implementation in UK settings.
Rogers IS, Emmett PM, ALSPAC Study Team. Fat content of the diet among preschool children in Southwest Britain: ii relationship with growth, blood lipids, and iron status. *Pediatrics* 2001;108(3)URL: http://www.pediatrics.org/cgi/content/full/108/3/e49.	Not an intervention study.
Sahota P, Rudolf MCJ, Dixey R, Hill AJ, Barth JH, Cade J. Randomised controlled trial of primary school based intervention to reduce risk factors for obesity. *British Medical Journal* 2001;323(3):1–5.	Not preschool children.
Singleton JC, Achterberg CL, Shannon BM. Role of Food and nutrition in the health perceptions of young children. *Journal of the American Dietetic Association* 1992;92(1):67-90.	Four-week study and follow-up only.
Stephen C, Brown S. The impact of government intervention in pre-school provision. *Early Child Development and Care* 1999;153:1–17.	No real outcome data on what, PA or food.
Sugimori H, Yoshida K, Izuno T, Miyakawa M, Suka M, Sekine M, Yamagami T, Kagamimori S. Analysis of factors that influence body mass index from ages 3 to 6 years: A study based on the Toyama cohort study. *Pediatrics International* 2004;46:302–10.	Not an intervention study.
Taylor LJ, Gallagher M, McCullough FSW. The role of parental influence and additional factors in the determination of food choices for pre-school children. *International Journal of Consumer Studies* 2004;28:337–46.	Not an intervention study.
Trost SG, Sirard JR, Dowda M, Pfeiffer KA, Pate RR. Physical activity in overweight and non-overweight preschool children. *International Journal of Obesity* 2003;27: 834–839.	Not an intervention study.
Wardle J, Cooke LJ, Gibson L, Sapochnik M, Sheiham A, Lawson M. Increasing children's acceptance of vegetables; a randomized trial of parent-led exposure. *Appetite* 2003;40:155–62.	Two-week study only.
Warren JM, Henry CJK, Lightowler HJ, Bradshaw SM, Perwaiz S. Evaluation of a pilot school programme aimed at the prevention of obesity in children. *Health Promotion International* 2003;18(4):287–96.	In school children.
Whitaker RC, Sherman SN, Chamberlin LA, Powers SW. Altering the perceptions of WIC health professionals about childhood obesity using video with facilitated group discussion. *Journal of the American Dietetic Association* 2004;104(3):379–86.	No control. No follow-up
Williams CL, Bollella MC, Barbara CDN, Strobino BA, Spark A, Nicklas TA, Tolosi lb, Pittman BP. Healthy Start: Outcome of an intervention to promote a heart healthy diet in preschool children. *Journal of the American College of Nutrition* 2002;21(1):62–71.	No outcome data available
Yoshinaga M, Sameshima K, Miyata K, Hashiguchi J, Imamura M. Prevention of mildly overweight children from development of more overweight condition. *Preventive Medicine* 2004;38:172–4.	Not preschool children.

Excluded systematic reviews	Reason for exclusion
Campbell K, Waters E, O'Meara S, Summerbell C. Interventions for preventing obesity in childhood. A systematic review. *Obesity Reviews* 2001;2:149–57.	Study not relevant to pre-school children apart from Mo-Suwan (1998).
Clar C. Reduction of obesity by lifestyle management in children and adolescents. A review of systematic reviews. University of Aberdeen 2005, unpublished.	Unpublished – excluded because it is a review of reviews.
Haddock CK, Shadish WR, Klesges RC, Stein RJ. Treatments for childhood and adolescent obesity. Annals of Behavioral Medicine 1994, 16(3), 235-44.	Not relevant.
Jago R, Baranowski T. Non-curricular approaches for increasing physical activity in youth: a review. *Prevention Medicine* 2004;39:157–63.	No studies used in the review were of preschool age.
Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE et al. & the Task Force on Community Preventive Services. The Effectiveness of Interventions to Increase Physical Activity. *American Journal of Preventive Medicine* 2002;22(4s):73–107.	No outcomes or details of interventions available. The paper offers generalised physical activity guidelines to increase PA and fitness.
Lanigan JA, Bishop JA, Kimber AC, Morgan J. Systematic review concerning the age of introduction of complementary foods to the healthy full-term infant. *European Journal of Clinical Nutrition* 2001; 55:309–20.	Most of the children studies are under 2 years of age.
O'Meara S, Glenny AM, Sheldon T, Melville A, Wilson C. Systematic Review of the effectiveness of interventions used in the management of obesity. *Journal of Human Nutrition and Dietetics* 1998;11:203–6.	Generalised to the whole population and not pre school children.
Reilly JJ. Obesity prevention in childhood and adolescence: a review of systematic reviews. In: Cameron N, Norgan NG, Ellison G, eds. Childhood obesity: strategies for prevention. Boca Raton: CRC Press (in press).	No specific information on preschool studies.
Reilly JJ, McDowell ZC. Physical activity interventions in the prevention and treatment of paediatric obesity: systematic review and critical appraisal. *Proceedings of the Nutrition Society* 2002;62:611–9.	The section on 'Ongoing research' highlights the MAGIC study and results of the MAGIC pilot study.
Riddoch C, Puid-Ribera A, Cooper A. Effectiveness of Physical activity promotion schemes in primary care: a systematic review. London; Health Education Authority 1998.	Is more generalised and not specific to preschool children.
Stone EJ, McKenzie TL, Welk GJ, Booth ML. Effects of physical activity interventions in youth. Review and synthesis. *American Journal of Preventive Medicine* 1998;15(4):298–302.	Has some relevance to preschool children.
Swadener SS. Nutrition education for preschool children. Journal of Nutrition Education, 1995; 27: 291-297.	Relevant studies but written in 1994.
Tedstone AE, Aviles M, Shetty PS, Daniels LA. Effectiveness of interventions to promote healthy eating in preschool children aged 1 to 5 years: *A Review*. Health promotion effectiveness reviews 10. London: Health Education Authority, 1998.	A lot of relevant studies but not as up to date as Worsley 2004

Appendix 7

School-based interventions to prevent obesity

EVIDENCE SUMMARY TABLES

EVIDENCE TABLE 1: SCHOOL-BASED INTERVENTIONS TO MAINTAIN A HEALTHY WEIGHT/PREVENT OVERWEIGHT OR OBESITY

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
DIET ONLY STUDIES								
James 2004	RCT Cluster, by class	1	++	**Setting:** Schools in Christchurch, Dorset, UK. **Participants**: Twenty-nine classes in six junior schools in children aged 7–11 years. 320 females, 324 males, mean age 8.7 (range 7–10.9) years. *n* (randomised to intervention) 325 (15 classes). *n* (randomised to control) 319 (14 classes). Baseline mean BMI (SD): Intervention: 17.4 (0.6) kg/m^2	**Aim:** To reduce consumption of carbonated drinks. One investigator delivered programme to all classes and teachers assisted. One-hour session each class each term (four sessions) encouraging children not to drink carbonated drinks but to switch to water or fruit juice diluted 1:3 with water. Study had 90% power.	12-month intervention.	Assessed at 12 months: Intervention *n* = 295 Control *n* = 279 10.9% not assessed Change in body mass index (BMI) over 12 months not significantly different between intervention and control 0.7 (0.2) vs. 0.8 (0.3) kg/m^2. Percentage of overweight and obese children increased in the control group by 7.5% at 12-months compared with a decrease in the intervention group of 0.2% (mean difference 7.7%, 95% confidence interval [CI] 2.2, 13.1).	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				Control: 17.6 (0.7) kg/m^2				
PHYSICAL EDUCATION ONLY STUDIES								
Flores 1995	RCT Cluster, by class	1	+	**Setting:** Four physical education (PE) classes at one school in Palo Alto, CA, USA. **Participants**: 10–13-year-olds, boys and girls, mean age 12.6 years. 54% female. *n* (intervention baseline) = 43; *n* (control baseline) = 38. **Baseline BMI:** Intervention girls: 22.9 (SD 6.1) kg/m^2 Control girls: 22.9 (SD 4.4) kg/m^2 African American (44%) and Hispanic	**Aim:** To evaluate an aerobic dance programme to help maintain or decrease weight. **Intervention:** Culturally sensitive health education curriculum twice a week plus dance orientated aerobic physical education class three times a week (50 min each) for 12 weeks. **Control:** Usual PA (playground activities) Delivered by teachers and trained personnel from the research team.	12 weeks.	*n* (intervention follow-up) = 26 girls, number of boys not reported *n* (control follow-up) = 23 girls, number of boys not reported. Statistically significant reductions in BMI (kg/m^2) between intervention and control girls at 12-weeks: Intervention girls: 22.1 (SD 6.0) Control girls 22.5 (SD 4.4) This represents a change of –0.8 kg/m^2 in the intervention group and +0.3 kg/m^2 in the control group (p <0.05). No statistically significant change between intervention and control boys re BMI (BMI –0.2 kg/m^2 intervention boys vs. –0.6 kg/m^2 control boys).	Only results for girls were presented in the paper. Programme piloted. Attendance at intervention was mandatory as it took place in usual PE class. Rewards given (juice, stickers, t-shirts) for participation.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				(43%)	Power not stated.			
Jamner 2004	CCT Cluster by school	2	+	**Setting:** Two public high schools in Orange County, CA, USA **Participants:** 58 female adolescents, 25 intervention and 22 control. Mean age = 14.94 (SD 0.79) years. Mean baseline BMI percentile = 67.28 for intervention completers) mean baseline BMI percentile = 60.47 for control completers. 53% non-Hispanic white, 29% Hispanic, 8% Asian and 3% 'other'.	**Aim:** To evaluate the effect of a school-based intervention designed to increase PA among sedentary adolescent females. **Intervention**: Special PE class. The class met five days per week for 60 min each day (approximately 40 min of activity time). Types of activity included aerobic dance, basketball, swimming and tae bo. One day per week of class time was devoted to a lecture or discussion focusing on the health benefits of physical activity (PA) and strategies for	4 months	At follow-up, data were available for 25 intervention participants and 22 control participants. The intervention had no significant effect on BMI percentile, 67.28 at baseline and 66.74 at 4 months; % body fat 32.64 at baseline and 31.85 at 4 months.	Study participants overall reported more moderate and less light activity at baseline, as these measures were obtained during summer vacation, whereas follow-u*p* assessments were conducted during the school year which may have confounded results.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					becoming more physically active. Not stated who delivered intervention. Power not stated – small study.			
Mo-suwan 1998	RCT Cluster, by class	1	+	**Setting**: Two kindergartens in privately owned schools Southern Thailand (Hat Yai municipality, Songkla province). **Participants**: Second year kindergarten pupils, boys and girls, aged 4.5 (SD 0.4) years. *n* (intervention baseline) = 158; *n* (control baseline) = 152. **Baseline BMI (kg/m^2):** Intervention: 16.25	To evaluate the effect of a school-based aerobic exercise programme on obesity indexes of preschool children. 15-min walk before morning class, 20-min aerobic dance session after afternoon nap, three times per week for 29.6 weeks. Delivered by teachers and Aerobic session led by trained personnel. Power not stated.	30 weeks	*n* (intervention follow-up) = 147 *n* (control follow-up) = 145. Both intervention and control groups experienced reduction in BMI (kg/m^2) and not significantly different between groups at 30-weeks: Intervention: 15.76 (2.46) Control: 15.94 (2.26) Not significant No significant difference between groups in skinfold thickness at 30-weeks. Intervention girls had significantly lower mean BMI at 30-weeks than intervention boys ($p < 0.01$). Intervention girls had lower likelihood of having an increased	Statistically accounted for the potential unit of analysis errors. Both schools had 1 hour physical education per week and one school had swim class for 1-hour per week (adjustments made for these children). Triceps skinfold thickness (TSF) also available. Appears to be informed by an environmental change model.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				(2.35) Control: 16.36 (2.22)			BMI slope than the control girls (Odds ratio [OR] 0.32; 95% CI 0.18, 0.56).	
Pangrazi 2003	CCT Control schools were not randomly selected	2	+	**Setting:** Thirty-five schools in Arizona, USA **Participants**: Fourth grade, mean age for boys and girls was 9.8 years (SD 0.6). PLAY + PE: *n* = 183 PE only *n* = 175 PLAY only *n* = 150 No treatment control *n* = 91	**Aim:** To evaluate the effects of the PLAY intervention Promotes 30–60 min moderate to vigorous PA daily, 15-min activity break each day to teach variety of physical activities, promotes attitudes and behaviours to sustain active habits for life; includes self-monitoring and self-awareness. Teachers received training from county health co-ordinators. PLAY is not intended to replace comprehensive PE programme but act as important supplement.	12 weeks	However, no significant differences between groups were found for BMI.	Previously adopted in Arizona elementary schools and 24,000 children have received the intervention. No treatment control not randomly assigned.

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
					The intervention comprised three stages: Step 1: promote play behaviour (first week) teachers and students participated, more walking, less standing, sitting, children were informed about the importance of PA and identified appropriate adult role models. Step 2: teacher-directed activities (3 weeks) games and activities that were enjoyable and could be played outside school. Step 3: encourage self-directed activity (8 weeks) with students aiming to achieve 30 min of			

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					activity per day independently of teacher outside school. Treatment and PE schools, children received log sheets similar to the PLAY ones but were asked to record their after school activities (active and sedentary). Teachers trained by county co-ordinators, with programme implemented across Arizona with more than 24,000 children receiving PLAY. Power not stated.			
Pate 2005	RCT Cluster by school	1	+	**Setting**: Twenty-four high schools in 14 South Carolina counties, USA. **Participants**: 2744 girls, 48.7% African American	**Aim:** To evaluate school-based PA intervention among high school girls. **Intervention:** LEAP, based on social ecological	Start of 9th grade through until Spring? Approx. 6 months?	Intervention: 863 Control: 741 Completers only Slightly higher % African American girls lost to follow-up. % Girls classified as overweight or at risk for overweight (at least	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				and 46.7% white, mean age 13.6 years, mean BMI 23.1 kg/m^2.	model drawn mainly from social cognitive theory; LEAP project staff supported the LEAP teams within the schools which included a LEAP champion; girl friendly PA of moderate to vigorous PA for 50% or more of PE class time (aerobics, dance, walking, self-defence, martial arts, weight training plus competitive sport and traditional PE). Environmental change included role modelling by school staff, family and community-based activities. School personnel headed by a champion implemented programme with training from		85th percentile BMI 34% both groups) or overweight (at least 95th percentile BMI 17% both groups) did not differ between intervention and control.	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					research staff. Power not stated.			
Robinson 1999	RCT Cluster, by school	1	++	**Setting**: Two public elementary schools in San Jose, CA, USA. **Participants**: Third and fourth grade students, mean age 8.9 years, boys and girls. *n* (intervention baseline) = 95; *n* (control baseline) = 103. BMI (kg/m^2) at baseline: Intervention: 18.38 (3.67) Control: 18.10 (3.77)	**Aim:** To evaluate a school-based intervention to reduce TV, videotape and video game use on adiposity. Designed to have 80% power to detect an effect size of 0.20 or greater. Based on Bandura's social cognitive theory; 18 × lessons of 30 to 50 min, included self-monitoring of TV, videotape and video game use, then 10-day turn-off, then 7-hour budget, children taught to become selective viewers and advocators of reducing media use.	6 months	*n* (intervention follow-up) = 92; *n* (control follow-up) = 100. Three children lost to follow-up in each group. Compared with controls, children in the intervention group had statistically significant relative decreases in BMI –0.45 kg/m^2 with 95% CI –0.73, –0.17, *p* = 0.002; TSF –1.47 mm with 95% CI –2.41, –0.54, *p* = 0.002; and waist-to-hip ratio –0.02 with 95% CI –0.03, –0.01, *p* <0.001.	Each household received electronic television time manager (control power to TV and VCR). Schools were matched. Assessors blinded.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					Parental involvement. Programme built into standard curriculum and taught by classroom teachers trained by research staff. Study 80% power to detect effect size at least 0.20.			
Sallis 1993, 1997	RCT Cluster, by school	1	+	**Setting**: Seven suburban elementary schools in Southern California, USA. **Participants**: Elementary school children, mean age 9.25 years. Seven schools involved, six schools randomly assigned to the three experimental conditions and one further school added to the	To evaluate a school-based intervention involving physical education and self-management (delivered either by specialists or teachers) on weight and adiposity, Three × 30-min classes per week including warm-up, fitness activities such as walk/run/jog/aerobic dance and sports	2 years	Total 549 children assessed at follow-up (305 boys and 244 girls); 26% attrition. Boys (after intervention) *n* control = 101, *n* specialist-led = 91, *n* teacher-led = 113. Girls (after intervention) *n* control = 97, *n* specialist-led = 60, *n* teacher-led = 87. Specialist PA promotion programme did not produce significant reductions in children's BMI or adiposity. No differences observed between teacher-led and specialist-led programme.	Interim results only (2 year data from 3-year study). Actual data for BMI and skinfold thicknesses is only presented in graphical form.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				control group. 85% non-Hispanic white. *n* total (intervention and control at baseline) = 745.	skills such as soccer/basketball/softball; plus weekly 30-min self-management training, also incentives and parental involvement through newsletters and signature on weekly goal sheets. Two intervention groups receiving same programme but provided by either certified PE specialist or teachers trained for total 38 hours in-house over 2 years with substitute teachers provided and provided with detailed daily lesson plans to implement programme. Power not stated.		All boys in all three groups increased their BMI over 2 years. Control girls had significantly lower BMI than girls in either teacher-led or specialist-led intervention group ($p < 0.01$). Changes in skinfold thicknesses not significant between groups in girls or boys.	
Schofield 2005	CCT	2	+	**Setting:** Three high schools	To pilot efficacy of using pedometer as	12 weeks	Pedometer: *n* = 23 Minutes: *n* = 21	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
	Cluster by school			in central Queensland, Australia. **Participants**: Low active girls (defined from previous study as those girls who took least amount of recorded steps). Mean age 15.8 years. **BMI:** Pedometer intervention: 22.3 (SD 4.1) kg/m^2 Minutes intervention: 23.7 (SD 6.6) kg/m^2 Control 24.5 (SD 5.5) kg/m^2 Pedometer intervention: *n* = 27 Minutes intervention: *n* = 28 Control: *n* = 30	basis of time efficient yet effective non-curriculum school-based programme Intervention; group meetings once a week for 6 weeks for 30 min each in groups of eight either before or after school or in lunch break. Intervention groups received log book to record min in PA or amount of step counts; actual activity intervention was 12 weeks with weeks 7–12 maintenance phase (no group meetings). **Pedometer intervention:** 1000–2000 step increase daily each week until reached 10,000 steps per day.		Control: *n* = 24 No significant difference between groups for BMI or from baseline to follow-up.	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					Minutes intervention: Increase by 10–15 min daily each week until reached daily average of 30–60 min/day. Power not stated.			
Stephens 1998	CCT Cluster, by school	2	+	**Setting:** Two urban elementary public schools in Cleveland, OH, USA. **Participants:** 56% boys, 8.4 years, 98% African American in intervention group; 43% boys, 8.4 years, 78% African American in control. 'Predominantly from low income families' – no other details reported.	To evaluate a school-based supplementary programme of PA on weight in addition to usual PE (45 min once per week). Control children received usual PE (45 min once per week). Delivered by medical student volunteers who received a 2-day orientation session. Power not stated.	15 weeks	Control group gained significantly more weight (p <0.001). Weight (kg) intervention vs. control at 15 weeks = 25.8 vs. 27.0. Significant decrease in skinfold thickness intervention vs. control, p < 0.01. Baseline: 25 vs. 26 mm 15 weeks: 23.5 vs. 28.5 mm	Significantly more black children in intervention compared with control group (p < 0.01).

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
				n (intervention – baseline and follow-up) = 45; *n* (control – baseline and follow-up) = 44. Weight in kg at baseline intervention vs. control = 25.4 vs. 26.1.				
Trudeau 2000, 2001	Unclear, controlled, CCT	2	–	**Setting**: Primary schools in Trois-Rivieres, Quebec, Canada. **Participants**: Primary school boys and girls aged 6 years at baseline, all children French descent. Intervention: *n* = 272 Control: *n* = 275	To evaluate whether a programme of PA and fitness in school children over 6 years would result in enhanced cardiovascular fitness in adulthood. The Trois-Riveries Growth and Development study was a 6-year intervention involving 1 hour per day (5 hours per week) of physical education to increase aerobic and muscular capacity, in	Twenty-two-years follow-up of 6-year intervention study	Random selected sample (22% of original group) contacted by telephone for follow-up: Intervention: *n* = 68 Control: *n* = 65 Mean age 33–34 years No significant difference between intervention and control with respect to BMI, body fat, skinfold thickness, waist-to-hip ratio (Trudeau 2000). Baseline values not reported. Comparisons of tracking suggested intervention and control developed similar gains in BMI and skinfold thicknesses over 22-year interval (Trudeau 2001).	Small sample followed-up, with control women significantly older and intervention and control women earning significantly less income per annum despite similar education levels (14 years of schooling). Author contacted regarding BMI status of intervention and control groups during original study.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					comparison to a control group that received single 40-min PE per week. Delivered by research team for follow-up. Professional physical educators provided original intervention. Power not stated, subgroup analysis unlikely to be powered.		Change in BMI (kg/m^2) over 22 years intervention vs. control: 5.7 (0.4) females (*n* = 57), 8.6 (0.4) males (*n* = 56) vs. 5.8 (0.3) females (*n* = 38), 8.0 (0.2) males (*n* = 40). BMI was not significantly different between intervention and control groups at age 10, 11, 12 and 34 years. Skinfold thickness change also available (not significant between groups).	
DIET AND PHYSICAL EDUCATION STUDIES TO PREVENT OBESITY								
Caballero 2003	RCT Cluster, by school	1	+	**Setting**: Forty-one elementary schools in seven American Indian communities in Arizona, New Mexico, South Dakota, USA. **Participants**: Mean age 7.6 ± 0.6 years. Sex not reported.	**Aim:** To evaluate a school-based multi-component intervention to reduce percentage body fat in American-Indian children. **Intervention:** Four components: 1) Change in dietary	3 years	*n* (intervention at follow-up) = 727 *n* (control at follow-up) = 682 17% attrition. Completer analyses only. No significant difference in weight, BMI, % body fat or skinfold thickness between intervention and control groups. BMI in the intervention group at baseline was 19.0, at follow-up 22.0. In the control group BMI was 19.1 kg/m^2 at baseline and	Intervention piloted. Compared with Centers for Disease Control (CDC) reference values, distribution of BMI in study children was shifter towards higher values.

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				American Indian school children. Six schools randomly assigned to the three experimental conditions and one further school added to the control group. *n* (intervention) = 879 *n* (control) = 825	intake (Pathways guidelines for food-service personnel and regular visit by Pathways nutritionist to support and monitor school lunches). 2) Increase in PA (3 × 30-minute moderate to vigorous PA based on SPARK programme (see Sallis 1993) per week during term-time, exercise break during classroom time and guided play during recess). 3) A classroom curriculum focused on healthy eating and lifestyle (12 weeks per year, 8 weeks in 5th grade, twice weekly 45-min classroom lessons integrating social learning theory with		22.2 kg/m^2 at follow-up. Mean difference in BMI = –0.2 (95% CI –0.50, 0.15) kg/m^2. % Body fat increased by approximately 7% in both groups at 3 years.	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
					American Indian traditions and indigenous learning modes such as story telling). 4) A family-involvement programme (family fun nights, workshops, events at school and fun packs linked to classroom curriculum). Almost the entire intervention was delivered by school personnel, teachers and food service staff; the Pathways staff focused on research measurements and training and support of school staff. Teachers, food service staff and PE teachers trained annually by SPARK or PATHWAYS instructors and			

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
					supported within schools. Power not stated.			
Donnelly 1996	CCT By school	2	+	**Setting:** Elementary schools in rural Nebraska, USA. **Participants:** Age 9.2 years. Boys and girls (no values given). 94% White, 42–44% received free and reduced school lunches. Mean BMI (kg/m^2): Intervention: 18.3 (SD 3.9) Control: 18.5 (SD 3.4) Intervention *n* = 102; Control *n* = 236	**Aim:** To evaluate a school-based PA and nutrition programme to attenuate obesity and promote fitness. Components included a nutrition intervention (changes to school lunches using Lunchpower! which is a reduced energy, fat and sodium lunch, and nutrition education in curriculum) and PA intervention of 30–40 min per day 3 days per week of aerobic activities. Utilised school curriculum and existing staff resources.	2-years	Completer analysis only for BMI (kg/m^2) at 2 years Intervention Baseline: 17.9 (SD 3.8) *n* = 44 2-years: 18.9 (SD 4.3) *n* = 44 Control Baseline: 18.1 (SD 2.6) *n* = 64 2-years: 19.3 (SD 3.2) *n* = 64 Significant increase in both groups from baseline to follow-u*p* but no significant difference between groups. Authors suggest children compensate in energy intake and PA outside school.	Small rewards for volunteers.

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
					Research nutrition staff consisted of PhD student in nutrition, registered dietitian, and several graduate students. PA research staff comprised an exercise physiologist and graduate students. Power not stated.			
Gortmaker 1999; Austin 2005	RCT By school	1	+	**Setting**: Ten secondary schools in Boston, USA. **Participants**: Girls and boys, grades 6 and 7, mean age 11.7 (SD 0.7) years for both intervention and control. 48% female BMI (kg/m^2): Baseline 20.6 (SD 4.5)	**Aim:** To evaluate impact of school-based health behaviour intervention known as PLANET HEALTH on obesity amongst boys and girls in grades 6 to 8. Implemented programme via existing school staff and curricula. Underpinned by behavioural change and social cognitive	Two school years.	Intervention *n* = 641, control *n* = 654, 17% loss to follow-up. At 2 years: prevalence of obesity among girls in the intervention schools was reduced compared with controls, controlling for baseline obesity (OR 0.47; 95% CI 0.24, 0.93; *p* = 0.03). Among boys obesity declined among both control and intervention students however, after controlling for co-variates, there was no significant difference in outcome (OR 0.85; 95% CI 0.52, 1.39, *p* = 0.48).	Obesity definition based on BMI and TSF measure greater than or equal to 85th percentile of age and sex-specific reference data statistically accounted for the potential unit of analysis errors. Blinded outcome assessment was reported. Also reported on the issue of the promotion of unintended side

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				Intervention, 20.7 (SD 4.0) Control (based on completers only) Higher % African American girls in control schools (17 vs. 10%) and Hispanic boys in control schools (18 vs. 12%). Intervention *n* = 1560 on total at baseline	theory. Promotion of PA, modification of dietary intake (decreasing consumption of high-fat foods, increasing fruit and vegetable consumption) and reduction of sedentary behaviours (with a strong emphasis on reducing television viewing). 32 classroom lessons of 45-min each over 2 school years. Utilised school curriculum and existing staff resources. Only 33 incident cases of obesity 'limited the statistical power of the study to detect differences'.		There was greater remission of obesity among intervention girls vs. control girls (OR 2.16; 95% CI 1.07, 4.35, $p = 0.04$). Intervention reduced television hours among both girls (–0.58 hours; 95% CI –0.85 to –0.31, $p = 0.001$) and boys (–0.4 hours, 95% CI –0.56, –0.24; $p < 0.001$). Author concludes that reductions in TV viewing predicted obesity change and mediated the intervention effect (in girls but not boys). Among girls, each hour of reduction in television viewing predicted reduced obesity prevalence (OR 0.85; 95% CI 0.75, 0.97; $p = 0.02$). Measures of extreme dieting behavior remained unchanged (and low) throughout the intervention and were not different between intervention and control schools. Analysis of girls only using self-report, showed a reduced risk of using self-induced vomiting,	effects (extreme dieting behaviours). Schools experienced with interdisciplinary curricula found it easier to implement Planet Health material.

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							laxatives or diet pills to control weight within the previous 30 days.	
Graf 2005	CCT Cluster by school	2	+	**Setting:** Seven primary schools in Cologne, Germany. Three schools were chosen to participate in a prospective programme of intervention, the step TWO programme, for prevention of obesity. Four schools served as controls. **Participants:** In total, 830 boys and 848 girls took part. Mean age = 8.2 ± 1.3 years; mean BMI = 17.1 ± 2.9 kg/m^2. Of all children 7.3% were obese, 10.4%	**Aim:** To present the baseline and final data from the step TWO programme. The step TWO programme, which is designed for overweight and obese children, consisted of health education and PA delivered by a team of nutritionists, gymnasts, psychologists and medical doctors. Power not stated.	8–9 months	Forty controls and 145 in the intervention group The increase in BMI tended to be lower in those undergoing intervention mean difference in BMI for the intervention and control groups were 0.27kg/m^2 and 0.66 kg/m^2 respectively (p = 0.069) After intervention, the increase in waist circumference with time was lower than the controls (3.11cm and 4.56cm respectively)	Intervention group had higher BMI, waist circumference and blood pressure at baseline than control. Body weight showed high correlations with the result of bioelectric analyses (r = 0.770, $p \leq 0.001$) and waist circumference (r = 0.857, $p \leq 0.001$), and low correlation with the waist-to-hip ratio (r = 0.180, p = 0.001) adjusted for gender and age. BMI showed high correlation with the results of bioelectric analyses (r = 0.839, $p \leq 0.001$) and waist circumference (r = 0.861, $p \leq 0.001$), and low correlation with the waist-to-hip ratio

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				were overweight, 75.7% were normal weight and 6.6% were underweight.				(r = 0.251, p = 0.001) adjusted for gender and age.
Kain 2004	CCT By school	2	+	**Setting**: Five primary schools in Santiago, Curico, Casablanca, Chile. **Participants**: 53.5% boys and 46.5% girls in intervention group, 52% boys and 48% girls in control. Mean age 10.6 (SD 2.6) years in both groups. Low SES (approximately 35% received school lunch programme). Intervention n = 2375 Control n = 1202 **BMI (kg/m^2):** Intervention 19.6 (SD 3.8) n = 2141	**Aim:** To evaluate a school-based nutrition education and PA intervention on adiposity and physical fitness. Post hoc power 0.8, alpha 0.05. Intervention children received 8–11 hours dietary education in 6th grade and 5–6 hours for 7th and 8th grade over 6 months; 90 min per week of PA (sport) by school PE/classroom teacher or research PE for 6 months; active recess once a day for the last 3 months; healthy kiosks; parental involvement (two	6 months	Intervention: 2141 Control: 945 12.7% attrition BMI significantly higher in control boys only at 6 months compared with intervention boys (intervention boys BMI maintained whilst control boys BMI increased). **Boys** BMI (kg/m^2) at baseline intervention vs. control: 19.5 (SD 3.7) vs. 18.9 (SD 3.3). BMI (kg/m^2) at 6-month follow-up intervention vs. control: 19.5 (SD 3.5) vs. 19.2 (SD 3.1). p < 0.001 TSF decreased insignificantly over time in both intervention and control boys. Waist circumference declined in intervention boys by mean 0.9 cm whilst in control boys it increased by mean 0.9	Study design allowed for bias in intervention schools for increased prevalence of obesity compared with control schools (significantly more obese in intervention schools). Include element of smoking cessation advice. **Process evaluation:** Healthy kiosks were not implemented despite meeting with vending owners. PE implemented because incorporated into the curriculum.

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				Control: 19.2 (SD 3.6) *n* = 945	meetings) and special activities including prize for eating the most healthy snacks. Delivered by research team when half of the teachers initially unwilling to provide nutrition education, research PE teacher when no regular PE teacher available. Teachers were directly involved and received 1-hour training per day from nutritionist and 2 hours per week from PE teacher for 4 months. All teachers received 2-day onsite training. Post hoc power of 0.8, alpha 0.05.		cm, $p < 0.0001$. **Girls** BMI (kg/m^2) at baseline intervention vs. control: 19.7 (SD 3.9) vs. 19.4 (SD 3.8). BMI (kg/m^2) at 6-month follow-up intervention vs. control: 20.0 (SD 3.8) vs. 19.6 (SD 3.8). Not significant. Slight non-significant increase in TSF and waist circumference in both intervention and control girls.	
Neumark	CCT	2	+	**Setting:**	To evaluate an	7-months total,	*n* (intervention) = 89	Girls knew were

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-Sztainer 2003	Cluster, by school			Six secondary Schools in twin cities area, school districts Minnesota, USA. **Participants:** 201 females. Mean age 14.9 (SD 0.9) years in intervention, 15.8 (SD 1.1) years in control. **BMI (kg/m^2) at baseline:** Intervention vs. control: 27.6 (SD 7.2) vs. 25.9 (SD 5.8). **Inclusion criteria:** Girls with BMI at or above 75th percentile *n* (intervention) = 89 *n* (control) = 112	obesity prevention programme that aimed to increase enjoyment and self-efficacy In high-school based girls. Girls-only PE programme with physically inactive girls who would be unlikely to attend after school clubs. Replaced existing low-aerobic physical education classes with dance classes (high-aerobic PA). Underpinned by social cognitive theory. The intervention addressed personal and behavioural factors in addition to PA four times per week, nutrition and social support session every other week for total of 16 weeks. Aided by community guest	16-week intervention plus 8-week maintenance plus follow-up 1-month later	*n* (control) = 112 **BMI (kg/m^2) at 8-month follow-up:** 26.97 vs. 26.98, $p = 0.95$.	enrolling into intervention or control (schools randomised before girls registered). Parents expressed strong enthusiasm for programme, and all thought it should be continued. They reported their daughters eating more healthily, doing more PA and were more accepting of their bodies. Parents made other suggestions such as being most willing to read relevant literature and buy healthier snacks, but were least willing to attend classes with daughters. The girls liked the food tastings, nutrition sessions, guest instructors, and the array of PA options. They thought the girls only aspect was very important component for the intervention's

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					instructors once a week, who led different activities such as kick-boxing, self-defence and water aerobics, community field trips with free passes to return and community links encouraged. Girls were advised to avoid dieting and increase fruit and vegetables and decrease fats and sugar intake, healthy food choices and taste-testing sessions. A maintenance component for 8 weeks included healthy informal lunch meetings and topic discussion. Postcards were mailed home every 2–3 weeks during first 16 weeks to enhance parental support.			success. In the three intervention schools, the Principals found ways of sustaining New Moves, and offered girls guest instructors and have now integrated nutrition and social support in to PE classes.

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					Delivered by research team, PE teachers and school counsellors. Power not stated.			
Sahota 2001	RCT Cluster, by school	1	+	**Setting:** Ten primary schools in Leeds, UK. **Participants:** 7–11-year-olds, boys and girls, mean age 8 years. *n* (intervention) = 314 *n* (control) = 322	Assessed the impact of a primary school-based intervention, which included teacher training, modification of school meals, the development of school action plans targeting the curriculum, physical education, tuck shops, and playground activities. Sahota used a population approach underpinned by the Health-Promoting Schools philosophy and the intervention involved the whole school community including parents, teachers and catering	1 year	*n* (intervention) = 292 *n* (control follow-up) = 303 (at 1-year follow-up for weight) At 1 year, there was no difference in change in BMI between the children in the two groups (BMI SD score, weighted mean difference 0 (95% CI –0.1, 0.1), nor was there any difference in dieting behaviour.	Statistically accounted for the potential unit of analysis errors 89% of the actions points were implemented in the ten schools and changes were made to the food provision. Both parents and teachers were supportive of the dietary education and promotion of PA. Parental questionnaires (64% returned) detailed suggestions for improvements such as promotion of healthier break-time snacks with enforcement by school, material on healthy eating for children and fun PA ideas. Of the 20 teachers invited, 19

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					staff. 80% power to detect difference in means of a normally distributed outcome measure of at least 1.8 standard deviations at 5% significance level.			attended and were satisfied training, resources and materials offered. Children had higher scores for knowledge, attitudes and were positive about the intervention in focus groups. APPLES intervention was successful in producing changes at the school level, in terms of changing the ethos of the schools and the attitudes of the children, but had little effect on children's behaviour other than a modest increase in the consumption of vegetables.
Sallis 2003	RCT Cluster, schools randomised by district	1	+	**Setting:** Twenty-four public middle schools (grades 6 to 8) in San Diego County, California. **Participants:**	**Aim:** To evaluate the effects of environmental, policy and social marketing interventions on PA and fat intake of middle school	Two school years	Number assessed in each group at follow-up not reported There was a significant reduction in BMI among intervention boys, compared with control boys, but there was no effect for girls.	All 24 schools received an incentive to participate (US$1000 for PE equipment), and intervention schools received an additional US$500 for kitchen equipment and

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				Mean enrolment across 24 schools was 1109 (SD 356) students per school, of whom 49% were female, 44.5%, were non-white, 39.5% received free or reduced school meals and 36.4% were bussed to school. Mean age and mean baseline BMI not reported.	students. The primary aims of the intervention were: 1) Increase the total energy expenditure from PA by the student population at school. 2) Decrease the grams of total saturated dietary fat purchased or brought to school by students. One intervention component was designed to increase PA in PE classes through changing lesson context, lesson structure, and teacher behaviour. Another intervention component was intended to increase PA on campus during leisure periods throughout the school day.		Boys BMI (kg/m^2) at baseline for the intervention and control groups, 20.12 (0.98) and 19.68 (0.63), respectively. BMI for the controls and the boys in the intervention group after 2 years 20.04 (0.85) and 19.84 (0.61). Girls BMI (kg/m^2) at baseline for the intervention and control groups, 19.76 (0.77) and 19.52 (0.89), respectively. BMI for the girls in the intervention group and the controls after 2 years 19.88 (1.16) and 19.73 (1.16), respectively. Gender-specific analyses revealed the time by condition interaction was significant for boys ($F = 12.16$, $p = 0.00$) with a large effect size of $d = 1.10$. The intervention was not significant for girls ($F = 0.73$, $p = 0.396$), and the effect size was small.	US$2000 for PA programmes or equipment.

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					Interventions with school food service staff and managers were undertaken to provide more low-fat choices at these sources. Delivered by research staff,, teachers, school food service staff and managers. Power not stated.			
Story 2003 GEMS-Minnesota	RCT	1	+	**Setting:** Lunchtime clubs in schools in low income areas, Minnesota, USA **Participants:** 8–10 year-old African American girls, at least 25th percentile for age and gender BMI, with a parent willing to be involved.	**Aim**: To assess feasibility of obesity prevention programme in African American girls **Intervention:** Lunchtime clubs in school designed to improve nutrition, PA and self-esteem through a range of activities. The intervention which was conducted twice	12 weeks	Intervention, *n* = 26 Control, *n* = 28 ITT analysis No significant difference between groups for BMI, waist circumference.	This study was a pilot study to assess feasibility and was not intended to be sufficiently powered to detect a significant intervention effect. Fully powered studies of two of the GEMS pilots are currently underway.

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				Mean age (years): Intervention: 9.3 (SD 0.9) Control: 9.4 (SD 0.9) Sex: girls only Intervention *n* = 26 Control *n* = 28	per week, focused on increasing healthy eating and PA. Intervention meetings, designed in a 'club meeting' format, were held twice per week for 1 hour after school at each of the schools used in the study. The intervention was based on Social Cognitive Theory (SCT) (Bandura) and targeted key points from three domains: 1) environmental factors such as peer support; 2) personal factors such as knowledge and values; 3) behavioural factors such as goal setting and social reinforcement. **Control:** The control group served as an 'active			

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					placebo', non nutrition/PA condition and focused on promoting positive self esteem and cultural enrichment. Participants attended monthly Saturday morning meetings (three meetings over 12 weeks). This included arts and crafts; self-esteem activities, creating memory books and a workshop on African percussion instruments. Providers of the intervention included University Staff, Trained African American GEMS staff and school staff. Study not powered (pilot).			
Warren 2003	RCT	1	+	**Setting:** Three primary	Be Smart was a school and family-	20-week intervention	Nutrition intervention at follow-up *n* = 42.	Considered the sustainability of their

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	Individual			schools in Oxford, UK. **Participants:** Children aged 5 – 7 years (children in Year 1 and Year 2). Sex not reported. **Mean BMI (kg/m^2) at baseline:** Nutrition intervention = 16.1 (2.7) PA intervention = 16.0 (2.0) Combined nutrition and PA intervention = 15.8 (2.0) Control = 15.5 (1.6) Nutrition intervention *n* = 56 PA intervention *n* = 54 Combined nutrition and PA intervention *n* = 54	based intervention to prevent obesity in children aged 5–7 years. There were four conditions: a nutrition group, a PA group, a combined nutrition and PA group and a control. The intervention ran for 20 weeks over four school terms (approx. 14 months). Underpinned by SCT and took place in lunchtime clubs where an interactive and age-appropriate nutrition and/or PA curriculum was delivered by the research team, with both involving parents. Power not stated.	over 14 months.	PA intervention at follow-up *n* = 42. Combined nutrition and PA intervention *n* = 42. Control *n* = 46. Dropout *n* = 46 for weight. Only those who completed were included in analysis (not ITT). No significant changes in the rates of overweight and obesity were seen as a result of the three different approaches. At the final assessment, the incidence of overweight and obesity was similar to the initial stage, with subject numbers too small for statistical analyses.	intervention and concluded that it would be too expensive and unsustainable as it was delivered by non-school personnel. Children enjoyed the practical tasks, quizzes and tastings. 83% of parents thought their child had benefited from the programme and all teachers thought that components should be integrated into the Personal, Social and Health Education (PSHE) curriculum. This study may have been subject to ceiling effects as the study population was relatively well educated as 39% of parents had obtained either a degree or a post-graduate qualification.

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				Control *n* = 54				
DIET AND PHYSICAL ACTIVITY INTERVENTIONS TO IMPROVE CARDIOVASCULAR HEALTH OR PREVENT DIABETES								
Trevino 2004, 2005	Cluster RCT	1	+	**Eligibility criteria:** Not clearly described. **Participants:** Fourth-grade students. **Setting:** Elementary schools located in low income inner city neighbourhoods of the San Antonio Independent School District, TX, USA Intervention (five schools) *n* = 200 Control (four schools) *n* = 187 **Age (mean):** Intervention 9.8 years Control 9.7 years	To evaluate the effect of the Bienestar Health Program (programme designed to reduce risk factors associated with the onset of type 2 diabetes) on physical fitness in low-income Mexican American children**.** The intervention was the Bienestar Health Program based on SCT in which personal factors, social factors and behaviour are inter-related and have dynamic influences on each other. The Bienestar program was designed to influence each determinant to	Eight-months follow-up. No further follow-up after 8-month intervention.	**Lost to follow-up:** All fourth grade students were invited to participate. 88% returned parental consent forms. Complete data was collected from 387 students (78%). Of 189 students in control grou*p* at baseline, complete data collected from 187. All 200 students in the intervention group at baseline returned complete data. **Weight:** Not reported **% Body fat:** Did not differ between groups; adjusted difference intervention (*n* = 619) vs. control (*n* = 602) +0.18 (95% CI, –1.75–2.11), *p* = 0.56 **Dietary fat intake**: Did not differ between groups (*p* = 0.52). **Physical activity:** Outcome reported is physical	Parents and students who participated in the programme received coupons denoted in dollar amounts as an incentive and reinforcement which could be exchanged for merchandise. These papers may be reporting interim results **Author's conclusion:** It is possible to improve the physical fitness of low-income Mexican American preadolescent children through a comprehensive school-based programme.

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				97% of students were Mexican American, more than 95% were in US Department of Agriculture food assistance programs, 53% female, an average of 3.5 people occupied each household, mean household incomes US$10,337 in the intervention group and US$11,691 in the control schools. **Baseline BMI (kg/m^2):** No difference in baseline BMI between intervention and control groups. Control boys 19.18 (SD 4.14) Intervention boys 19.23 (SD 4.78) Control girls 19.90 (SD 5.42) Intervention girls	decrease dietary fat and increase dietary fibre consumption and to promote participation in moderate to vigorous physical activities. Programme activities were bilingual and included a parent education and involvement programme, a classroom health and physical education curriculum, a student after school health club and a school cafeteria programme. Power not stated.		fitness measured using a modified Harvard step test. Change in physical fitness score (PFS) between pre-intervention and post- intervention was significantly different between intervention and control groups after adjusting for age and pre-intervention BMI, $F(1,381) = 8.69$, $p < 0.003$. Mean change in PFS: Control boys –0.52 (SD 1.08) Control girls 0.13 (SD 1.08) Intervention boys 3.37 (SD 1.08) Intervention girls 2.52 (SD 1.01)	

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				18.92 (SD 4.87)				
Luepker 1996 (CATCH)	RCT Cluster, by school	1	+	**Setting:** Ninety-six public state schools in 12 school districts in California, Louisiana, Minnesota and Texas. **Participants:** Mean age 8.76 years 2461 of 5106 were girls. Total cohort = 5106 at baseline. Ethnically diverse (white, African American and Hispanic).	To evaluate a school-based intervention including a home programme for the primary prevention of cardiovascular disease. Intervention schools further randomised into two groups both involving modifications to school food service (30% fat), enhanced PE (moderate to vigorous activity for 40% class time) and classroom health curricula, and 28 of the 56 intervention schools also had family education (activity packs and family fun nights) Control schools received usual care. Sample size calculation carried	3 years	Total *n* = 4109 at 3 years (21% dropout for serum cholesterol measurement at 3 years). BMI did not differ significantly between groups at 3 years.	Also addressed smoking (may confound). African American students and students in California were more likely to have dropped out. Intensity but not duration of PE lessons changed in intervention group compared with control.

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					out. PE specialists and teachers had 1 to 1.5 days of training each school year; training also for cooks and teachers. Sample size determined.			
Manios 1998, 1999, 2002	CCT By school	2	+	**Setting:** Schools in Iraklio and Rethimno (intervention) and Chania (control) Crete, Greece. **Participants**: First-grade primary school children aged 5.5 to 6.5 years; 509 boys and 453 girls. Random sample of 602 intervention pupils from 24 schools and 444 control pupils selected to test	To evaluate a school-based intervention involving a health and nutrition element and a physical fitness and activity element, on chronic disease risk factors Nutrition component comprised 13–17 hours classroom materials conducted by class teacher each year; 4–6 hours classroom material on theory of physical education and 2 × 45 min PE per week by PE teachers.	6 years	Total 831 available at 6 years, 787 assessed (those who did not change schools and completed) **At 3 years:** Change in BMI (kg/m^2) +0.7 (1.5) vs. +1.7 (1.4) intervention vs. control, $p < 0.0005$. **At 6 years:** BMI change intervention vs. control: +3.68 (SE 0.16) $n = 356$ vs. +4.28 (SE 0.16) $n = 285$, $p < 0.05$. **At 6 years:** Bicep skinfold thickness (mm) change intervention vs. control: +2.97 (SE 0.24) $n = 356$ vs. +4.47 (SE 0.24) $n = 285$,	'Know your body program' also included dental health, drug abuse and accident prevention. Results adjusted for baseline values, sex, BMI, change in height and parental education where appropriate.

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				effectiveness of programme.	Delivered by school teachers and PE teachers. Power not stated.		$p < 0.001$. **At 6 years:** Tricep skinfold thickness (mm) change intervention vs. control: +6.46 (SE 0.38) $n = 356$ vs. +7.90 (SE 0.39) $n = 285$, $p < 0.05$.	
Vandongen 1995	RCT Cluster, by school	1	+	**Setting**: Thirty schools in Western Australia. **Participants:** Age range 10–12 years. **BMI (kg/m^2) at baseline:** Fitness group: 18.2 (17.7–18.7) boys, 18.2 (17.7–18.7) girls. Fitness and school nutrition group: 18.1 (17.5–18.8) boys, 17.9 (17.4–18.5) girls School nutrition	To evaluate programme of fitness and nutrition alone and combined and school and home-based nutrition programmes to improve cardiovascular health. **Nutrition programme:** Increase consumption of fruit, vegetables, whole grain bread, and cereals relative to other foods and decrease consumption of fatty, sugary and salty foods, 33% energy	Nine months	971 of 1147 assessed at 9 months for blood pressure, anthropometric and fitness tests. No significant difference between groups for subscapular skinfold thickness (mm), % body fat or BMI (kg/m^2) respectively at 1 year: Fitness group: 18.2 (17.6, 18.8) boys, 18.4 (17.9, 19.0) girls Fitness and school nutrition group: 18.6 (17.9, 19.3) boys, 18.7 (18.0, 19.3) girls School nutrition group: 18.5 (17.9, 19.0) boys, 18.0 (17.5, 18.5) girls	All follow-up measures adjusted for baseline values.

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				group: 18.0 (17.5–18.5) boys, 17.5 (17.0–17.9) girls School and home nutrition group: 18.2 (17.4–19.0) boys, 17.5 (16.8–18.2) girls Home nutrition group: 17.7 (17.2–18.1) boys, 18.2 (16.9,18.9) girls Control group: 18.1 (17.5–18.6) boys, 17.6 (16.9–18.3) girls **Number of subjects:** Fitness group: *n* = 81 boys and 77 girls Fitness and school nutrition group: *n* = 81 boys and 81	intake as fat, 12% as sugar, 25 g fibre/day **School-based:** Ten × 1-hour lessons. **Home-based:** Homework exercise sheets. **Fitness:** Six × 30 min classroom sessions and 15 min every school day of activity to increase heart rate to 150–170 beats per min. Delivered by teachers and PE teachers who received in-service training sessions. Power calculations based on alpha level 0.05 and beta level of 0.8 to detect difference of five laps of Leger run with a standard deviation of		School and home nutrition group: 18.4 (17.6, 19.2) boys, 17.8 (17.1, 19.4) girls Home nutrition group: 17.8 (17.2, 18.3) boys, 18.7 (18.0, 18.9) girls Control group: 18.2 (17.6, 18.8) boys, 18.2 (17.4, 18.9) girls Triceps skinfold thickness decreased significantly in fitness + school nutrition group compared with controls.	

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				girls School nutrition group: *n* = 91 boys and 108 girls School and home nutrition group: *n* = 58 boys and 68 girls Home nutrition group: *n* = 97 boys and 84 girls Control group: *n* = 78 boys and 67 girls.	14.			

Evidence of corroboration (external validity)

Evidence of salience – Is it appropriate for the UK?

First author	Study design	Research type	Research quality	Study population	Research question and design	Length of follow-up	Main results	Confounders/comments
James 2004	RCT Cluster by class	1	++	Schools in Christchurch, Dorset, UK.	See above.	See above.	See above.	

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
Sahota 2001	RCT Cluster, by classroom	1	+	School in Leeds, UK.	See above.	See above.	See above.	
Warren 2003	RCT Individual	1	+	Schools in Oxford, UK.	See above.	See above.	See above.	
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design**	**Length of follow-up**	**Main results**	**Confounders/comments**
James 2004	RCT Cluster by class	1	++	See above. – Dorset, UK.	See above.	See above.	One of the authors delivered the intervention.	Average class size was 22 (SD 5).
Stice 2005	RCT Individual	1	+	**Setting**: High schools and one University in Austin, USA. **Participants:** Girls aged 14–19 with body image concerns (relied on self-selection). Intervention: *n* = 94 Control: *n* = 94 Baseline BMI (kg/m^2):	**Aim**: To evaluate an obesity prevention programme and specifically to evaluate the effects of a weight maintenance diet on bulimic symptoms in adolescent girls Intervention: 3 weekly 1-hour sessions in groups of six to ten participants, including health benefits of a balanced diet, thin	12 months	Intervention: n = 91 Control: n = 89 4% dropout BMI (kg/m^2): Intervention: 23.00 Control: 23.89 Not significant Logistic regression that controlled for initial body mass indicated risk for onset of obesity in non-obese at baseline, at any point in 12 months was significantly lower in intervention (1.2%) than control (11.4%).	Although non-UK, included as corroborative evidence regarding 'potential harms'. Girls blinded to study hypothesis and assessors blinded. US$100 for completing assessments Mean body dissatisfaction score 3.5 (vs. 3.0 from community

First author	Study design	Research type	Research quality	Study population	Research question and design (include power calculation if available)	Length of follow-up	Main results (include effect size(s)/confidence intervals for each outcome if available)	Confounders (potential sources of bias)/comments
				Intervention: 22.82 (SD 4.16) Control: 23.79 (SD 5.44) 57% White, 22% of mothers and 26% fathers had advanced degree.	ideal contrasted with healthy ideal, not asked to count calories or reduce energy intake to certain level, behaviour modification goals and review and individualised plan. **Control:** Assessment only parallel sessions.		Significantly greater increases in 'healthy eating' (fruit and vegetables and low fat) from baseline to 12 months, $p < 0.001$, and significant increases in exercise intensity from baseline to 6-months only compared with control. Significantly greater decreases in bulimic symptoms compared with control at 12 months, $p = 0.004$).	sample of adolescent girls).
Sahota 2001	RCT Cluster, by classroom	1	+	See above.	See above.	See above.	Delivered by teachers but the project team provided training for teachers and the project manager also provided input and support.	
Warren 2003	RCT Individual	1	+	See above.	See above.	See above.	The project team delivered the intervention.	

EVIDENCE TABLE 2: SCHOOL-BASED INTERVENTIONS TO IMPROVE BEHAVIOURS ASSOCIATED WITH MAINTENANCE OF A HEALTHY WEIGHT (DIET AND PHYSICAL ACTIVITY)

Evidence of efficacy (internal validity) for diet outcomes								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
DIET ONLY STUDIES								
French 2004	Review, five controlled studies and one CBA	2	+	Review methods not reported as this was a paper from a workshop. School-based, four studies targeted 4th and 5th grade students and one targeted secondary schools (Nicklas 1998) – all US based	Review of five multi-component school-based intervention studies to promote food and vegetable consumption. One CBA to examine effect of price reduction and promotional signage on sales of lower fat vending machine snacks in 12 secondary schools. Power of individual studies not reported.	All five controlled studies were 2–3 years in duration; the CBA was 1 year All five studies included classroom curriculum focusing on increasing students knowledge, developing behavioural skills, increasing motivation to choose fruit and vegetables	Three studies reported significant increases in fruit and vegetable servings per day among students in intervention vs. control schools (Baranowski 2000; Foerster 1998; Reynolds 2000). Across the five studies increases in fruit intake ranged from 0.2 to 0.6 servings per day and vegetable intake from 0 to an increase of 0.3 servings per day; total changes in fruit and vegetable intake across five studies ranged from 0 to 0.6 servings per day. Four studies reported fruit and vegetables intakes separately and effects were most often attributable to fruit intake; only one study reported significant increases in vegetable intake (Reynolds 2000); two studies reported significant	Most of these studies were funded as part of National Cancer Institute's five-a-day research programme.

						Three studies included food service component to increase fruit and vegetable availability by training food service staff to include more fruit and vegetables in meals and promote fruit and vegetables. At least two of the studies included a parent–home component usually consisting of newsletters to increase home consumption of fruit and vegetables. Two studies included a community component involving	increases in fruit intake (Reynolds 2000, Perry 1998). The one study in secondary schools (Nicklas 1998) did not observe significant effects on fruit and vegetable intake. Cannot assess which independent elements of the interventions affected behaviour change. **CBA:** Price reductions of 10, 25 and 50% on low-fat snacks were associated with significant increases in low-fat snack sales; percentages of low-fat snack sales increased by 9, 39 and 93%, respectively. Promotional signage was independently but weakly associated with increases in low-fat snack sales. Average profits per machine were not affected by the vending interventions.	

						community groups in developing and implementing activities to promote fruit and vegetable intake such as grocery taste tests or cookery demonstrations (Foerster 1998; Baranowski 2000). **CBA:** Low-fat snacks were added to 55 vending machines in a convenience sample of 12 secondary schools. Four pricing levels (equal price, 10% reduction, 25% reduction, 50% reduction) and three promotional conditions (none, low-fat label, low-fat label plus		

						promotional sign) were crossed in a Latin square design. Sales of low-fat vending snacks were measured continuously for the 12-month intervention.		
Woolfe 2005	Review	2	+	Overview of five school-based dietary interventions funded by the Food Standards Agency. Primary and secondary schools throughout UK.	To evaluate feasibility and effectiveness of dietary change interventions in UK school-based settings.	Short-term to 14 months	Overview of five school-based dietary interventions funded by the Food Standards Agency. All five studies focused on different approaches and topics but all have potential to be incorporated into the type of health promoting school approach, which systematic reviews (Lister–Sharp) have indicated is the most effective way of changing behaviour.	Non-systematic review. Supersedes Lister–Sharp systematic reviews of health promoting schools as relatively few included studies were UK-based. In terms of engaging schools: importance of listing support of school gate keepers (secretaries), a hindrance to engaging schools is selection to control, if schools are asked to 'buy-into' future initiatives this may lead to increased commitment compared with a

								research scenario; commitment of schools effects success of the project (tuck shops).
Warren 2003 within review by Woolfe 2005	RCT Individual	1	+	**Setting:** Three primary schools in Oxford, UK. **Participants**: Children aged 5 – 7 years (children in Year 1 and Year 2). Sex not reported.	Be Smart was a school and family-based intervention to prevent obesity in children aged 5–7 years. (See above.)	Twenty-week intervention over 14 months.	Nutrition intervention at follow-up n = 42 PA intervention at follow-up n = 42. Combined nutrition and PA intervention n = 42. Control n = 46. Dropout n = 46 for weight Only those who completed were included in analysis (not ITT). Significant increase in vegetable consumption ($p < 0.05$) and fruit ($p < 0.01$) in all groups; in males there was a significant increase in fresh fruit consumption $p < 0.01$ regardless of group assignment. Significant increase in fruit consumption in control ($p < 0.05$) and nutrition groups ($p < 0.05$). No significant difference between groups in sweet or crisps consumption. Strong association between parents and children's diets both before and after intervention for crisps, vegetables, salads, and fruit other than fresh ($p < 0.001$). Parental food frequency	See above.

							questionnaires showed little change as they reported low fat and medium to high fibre intakes initially.	
Moore 2001 within review by Woolfe 2005	RCT	1	+	Forty-three primary schools in South Wales and south-west England. 1902 pupils in years 5 and 6 (aged 9–11 years). At baseline, differences were detected in fruit and snack consumption between schools, which were statistically significantly associated with schools' policy on snacks brought into school.	To evaluate fruit tuck shops to increase fruit and vegetable consumption **Intervention:** Each school set up a fruit tuck shop in the autumn term, 1999. Tuck shops sold fruit at 15p per item, and were operated by the schools with no additional funding, and with limited support from the research team. Fruit was supplied to schools by wholesale greengrocers, fruit retailers, or by teachers buying fruit from supermarkets. **Control:** The other 20 schools agreed not to set up a fruit tuck shop in the academic year 1999/2000.	12 months	All 23 intervention schools successfully set up fruit tuck shops, and many schools were very positive about them. In particular, schools identified numerous positive spin-offs from the tuck shops, including benefits for the curriculum, social benefits, community links and litter reduction. In all schools, fruit sales were high in the first few weeks of operation, but then declined at varying rates over the intervention year. At 12 months there was no significant difference between intervention and control for fruit intakes. It is estimated that 70,000 fruits were sold in the 23 intervention schools over the year, but this equates to only 0.06 fruits per pupil per day. Four schools had ceased to operate their tuck shops by the end of the intervention year.	Authors concluded that fruit tuck shops on their own would not have a substantial impact on the fruit intake of pupils. However, they are likely to be a valuable component of any comprehensive plan to increase children's fruit consumption. Within schools, a comprehensive school policy on snacks brought to school supplemented by a school fruit tuck sho*p* (and, in England, by National School Fruit Scheme fruit provided to younger infants) may achieve a more substantial impact.
Livingstone 2002	Controlled study	?	?	Twenty-seven secondary schools	To evaluate interactive CD-ROM	Unclear, 4–5 weeks?	Preliminary evaluation in ten schools with 305 pupils divided equally	Questionnaires not validated.

within review by Woolfe 2005				in UK participated in one or more of the five phases of the study; representative of urban and rural environments and different social and ethnic backgrounds and academic abilities.	to promote nutrition education in 12-year old children. CD 'Dish it up!' was a virtual school day in life of a 12-year old and involved self-monitoring, analysis and food intake and goal setting; positive and entertaining activities aimed at promoting autonomy, decision-making skills and self-esteem with regard to healthy eating; based on social learning theory.		between intervention and control. Significant positive shifts in reported frequency of consumption of fruit, pasta, yoghurt, breakfast cereals (more than usual) and sweets (less than usual) but no other indications of changed eating behaviour. Children particularly liked the intervention.	Authors concluded that interactive multimedia tools have potential to be a sustainable and valuable resource.
Barker 2002 within review by Woolfe 2005	Controlled study	?	?	UK primary schools, main pilot carried out in school in Derbyshire, children aged 4–10 years old.	To test the effectiveness of a 9-month art/play therapy intervention on fruit and vegetable intake. Art/play therapist responsible for management of intervention that was built into the curriculum; aimed to change attitudes to healthy eating	Nine-month intervention, post-intervention delayed due to management reasons for 9 months.	Intervention increased amount of vegetables and salad and fruit juice consumed with an increase in the variety eaten; those children who ate no fruit at baseline appeared to respond more positively. No gender or age differences.	Small-scale pilot.

					through emotion and creativity rather than having a knowledge focus.			
Anderson 2002 within review by Woolfe 2005	CCT	?	?	Two primary schools with 2 matched control schools in Dundee, Scotland 'Five a day the Bash Street Way'. 128 children from year 2 (6–7 years) and year 6 (10–11 years).	To evaluate whole school approach with multiple strategies to increase fruit and vegetable intake. Included food preparation and food testing, increased provision of fruit and vegetables in tuck shops (had to complete with non-healthy foods) and school lunches, point of purchase marketing, teacher information sessions and parent newsletters.	Nine months (October to June of school year).	Fruit consumption increased significantly by average 0.5 portions per child per day in intervention schools compared with control ($p < 0.05$).	Relatively labour and time intensive intervention.
Bere 2005	CCT	2	+	**Setting:** Secondary schools from two Norwegian countries, Hedmark and Telemark. **Participants:** A total of 795, 7th graders (11 or 12 years old at	**Aim:** To investigate the effect of the Norwegian School Fruit Programme on the intake of fruit and vegetables and on the consumption of 'unhealthy' snacks both at standard conditions and when	8/9 months September, 2001 – May/June 2002	Free fruit *n* = 222 Paid fruit *n* = 157 Opted not to participate *n* = 416 The free fruit group reported a significantly higher intake of fruit and vegetables at school than pupils in the two other groups. No actual servings data ($p = 0.001$ for both comparisons).	Schools taking part in the programme at standard conditions and the control group were self-selected, that is, it was the schools that decided whether to take part in the programme or not.

				baseline) participated at both baseline and at follow-up. Free fruit *n* = 222 (nine schools) Paid fruit *n* = 157 (nine schools) Opted not to participate, *n* = 416 (20 schools) % Female and baseline BMI not reported.	provided for free. No more intervention details provided. Power not stated.		Furthermore, the pupils in the Paid fruit group reported a significantly higher intake than did pupils in the no fruit group. No actual servings data, *p* = 0.003. The free fruit group reported a significantly higher fruit and vegetable all day intake than both the paid fruit and the no fruit groups. No actual servings data, *p* = 0.03 and *p* = 0.003, respectively No significant differences were seen between the paid fruit group and the no fruit group regarding fruit and vegetable all day intake. The free fruit group reported a significantly lower intake of soda/candy/chips than the no fruit group. A significant positive effect of the Fruit Subscription Programme was seen for fruit and vegetables at school (with stronger effect for pupils with low baseline habitual fruit and vegetable intake), for fruits and vegetables all day, and for soda/candy/chips (for pupils with low baseline habitual fruit and vegetable intake only).	72% of children and 64% of the parents in the free fruit group rated the programme as ‘very good’ The pupils without two valid 24-hour recalls (baseline and follow-up *n* = 97) differed from the pupils with valid 24-hour recalls in that they were less physically active (mean values were 3.0 vs. 3.4 times per week, respectively) and a higher proportion of their parents participating in this study had education from college or university (52 vs. 40%).

Horne 2004	CBA	2	–	**Setting:** Two inner-city London schools, UK **Participants:** Children aged 5–11 years. **Intervention school:** Brixton, 364 pupils, 67% free meal entitlement, 85% ethnic minorities. **Control school:** Stockwell, 385 pupils, 46% free meal entitlement, 80% ethnic minorities.	To evaluate 'Food dudes' programme to increase consumption of fruit and vegetables. All children in all schools were presented with fruit and vegetables at lunchtime and 5–7 years received fruit at snack time. Intervention school also watched 'Food Dudes' video over 16 days featuring heroic peers and children received small rewards for eating those food themselves; two home packs also sent to parents to encourage fruit and vegetable consumption at home. Power not stated.	16-days and 4-month follow-up	At 4-month follow up there was a decline in intervention schools from immediate post-intervention but intervention school still consuming substantially more fruit and vegetables compared with baseline. **Baseline mean consumption:** Intervention 5–7 years: 20% fruit, 35% vegetables 7–11 years: 47% fruit, 51% vegetables Control 5–7 years: fruit 11%, 16% vegetables 7–11 years: 20% fruit, 36% vegetables **Four-month mean consumption:** Intervention 5–7 years: 56% fruit, 53% vegetables 7–11 years: 65% fruit, 63% vegetables Control 5–7 years: fruit 9%, 10% vegetables 7–11 years: 9% fruit, 23% vegetables In intervention school the largest increases were found in children who consumed least at baseline In control schools the largest	Was this the study that the 5-a-day data was based on (used as corroborative evidence for another review). Significant differences in fruit consumption at baseline.

							declines were seen in those who consumed most at baseline.	
James 2004	RCT Cluster, by class	1	++	**Setting:** Schools in Christchurch, Dorset, UK **Participants:** Twenty-nine classes in six junior schools in children aged 7–11 years. 320 females, 324 males, mean age 8.7 (range 7–10.9) years. *n* (randomised to intervention) 325 (15 classes) *n* (randomised to control) 319 (14 classes). Baseline mean BMI (kg/m^2) (SD): Intervention: 17.4 (0.6) Control: 17.6 (0.7)	**Aim:** To reduce consumption of carbonated drinks. One investigator delivered programme to all classes and teachers assisted. One-hour session each class each term (four sessions) encouraging children not to drink carbonated drinks but to switch to water or fruit juice diluted 1:3 with water. Study 90% power.	12-month intervention.	Assessed at 12 months: Intervention *n* = 295 Control *n* = 279 10.9% not assessed Both control and intervention groups significantly increased consumption of water (intervention from 3.1 [1.1] glasses over 3 days at baseline to 4.3 [2.0] glasses at 12-months; control from 2.9 [0.3] glasses over 3 days to 5.1 [2.0] at 12 months).	
Loughridge & Barratt 2005	CCT	2	+	**Setting:** Three secondary schools in disadvantaged	**Aim:** To measure the effect of health promotion and the	3 months	The average volume of water drunk by students in the W+P school was greater (p = 0.05) than that drunk in the W and C schools.	Data presented are poor. The children enjoyed

				areas of North Tyneside. **Participants:** All children within the three schools were exposed to the study. Water (W) + active health promotion (P) *n* = 903 W *n* = 1190 Control (C) *n* = 872	free provision of cooled filtered water in school cafeterias, at both morning break and lunch time, on the consumption of water (free cooled filtered water, free jug and cup water, and bottled water on sale) and soft drinks during the school day. **Intervention**: Over a 3-month period one school was given cooled filtered water and active health promotion (W+P) – note that the active health promotion intervention took place over the first month only, one school had water only (W). The control school (C) received neither W or P. Power not stated.		Note: assume this is all sources of water drunk, but unclear from paper. The volume of soft drinks purchased at school by students before and during the intervention remained static in all three schools. Note: all assessments relate to consumption or purchase of drinks at school, not over the whole day.	the cooled filtered water and this is a relatively cheap and sustainable intervention to provide.
Lytle 2004 TEENS study	RCT By school	1	+	**Setting:** Middle schools in Twin cities, Minnesota, USA.	To evaluate school-based intervention to increase fruit and vegetable intake and lower fat food	2 years	Intervention *n* = 1425, control *n* = 1431. No significant difference between groups for total fruit and vegetable	Race and parents education significantly different between groups at baseline and so this

				Participants: 16 schools, *n* = 3, 878 (96% of those eligible). 51% male in intervention and in control; 70.1% white in intervention, 75.7% white in control; 22.2% of intervention and 17.3% control received free school lunch across groups; both parents having high school education all less 14.5% intervention, 10.8% control.	80% power to detect differences of 1.1 servings of fruit and vegetables and 1.9% difference in energy from total fat intake between treatment groups. Included random selection for 24-hour recall and student survey of all students. Ten nutrition education lessons in 7th and 8th grade, based on social cognitive theory. Family component with newsletters, behaviour coupons and prizes School-wide component included school food modification with school nutritional advisory councils made up of school administrators, school staff, parents, students, and TEENS staff.		intake, mean difference –0.492 (95% CI –1.032, 0.049). Or energy from fat, mean difference +0.635 (95% CI –0.866, 2.137). These difference not significant when analysed by high or low dose exposure to intervention. Students in intervention had slightly higher scores for food choice indicative of making lower fat choices (non-validated measure).	was adjusted for in analysis. Significant positive interim results not maintained at 2-year follow-up.

					Due to potential variability in dose of intervention that each school received – secondary data analysis performed by dose of intervention received by students. Regular classroom teachers and food service staff implemented the intervention. Power not stated.			
Perry 2004	RCT Cluster by school	1	+	**Setting:** Twenty-six elementary schools, from one large school district in the Twin Cities metropolitan area of Minnesota. **Participants:** 1,668 total students (49% female), 1st and 3rd grade. Mean age and Baseline BMI not reported.	**Aim:** To determine if a cafeteria-based intervention would increase the fruit and vegetable consumption of elementary school children. **Intervention activities included:** Increasing the availability, attractiveness and encouragement of fruit and vegetables. Special events were	24 months	At follow-up 1,168 (70%) students were observed (numbers in each group not reported). The number of fruits and vegetables on the snack cart was associated with increased fruit and vegetable consumption from baseline to follow-up (although there were no intervention vs. control differences). Significant impact on children's total fruit and vegetable intake (when potatoes were excluded). The impact however, comes from increases in fruit consumption (0.17 vs. 0.14 servings, respectively), as there were no significant differences between conditions for juices and	Intervention dose was limited to the kinds and amounts of fruits and vegetables served, the attitudes and behaviours of the food service staff, and to the specific activities that could be physically done in the lunch-room environment.

					held, such as sampling sessions and challenge weeks. Food service staff delivered the intervention. Power not stated.		vegetables. **Lunch observations:** Verbal encouragement by food service staff in the lunch line was significantly associated with consumption of fruits and vegetables (no potatoes, no juice), fruits and vegetables (no potatoes), fruit (no juice), and increased consumption in fruits and vegetables (no potatoes, no juice) from baseline to follow-up.	
Wells & Nelson 2005	CCT	2	+	**Setting:** Seventeen primary schools on the outskirts of London in south-east England. **Participants**: All children within the 17 schools that were 4–6 years of age (age over which the intervention occurs), and also 7–8 years (to assess the impact of having had the intervention when aged 4–6 years old). Response rate was 51%. Children included in	**Aim**: To measure the short-term and long-term effect of the National School Fruit Scheme (NSFS) on daily fruit consumption. **Intervention:** Eight schools in the NSFS and nine not in the NSFS. Study and control schools were selected in areas of similar deprivation. Power not stated	2 years	Daily fruit consumption was assessed using a questionnaire that was given to each pupil to take home for their parents to complete and return. Median total fruit consumption (excluding fruit juice) in infants receiving free fruit was 117 g/d compared with 67 g/d in infants not receiving free fruit ($p < 0.001$). Median total fruit consumption in juniors who had received free fruit at school as infants was similar to that consumed by those who had not received free fruit (83 vs. 86 g/d).	

				the study were 'selected' samples from each year group. Unclear how samples were selected. Total *n* = 1492. Unclear how many in each group.				
PHYSICAL ACTIVITY INTERVENTION								
Robinson 1999	RCT Cluster, by school	1	++	**Setting:** Two public elementary schools in San Jose**,** CA, USA. **Participants:** 3rd and 4th grade students, mean age 8.9 years, boys and girls. *n* (intervention baseline) = 95; *n* (control baseline) = 103. **BMI (kg/m^2) at baseline:** Intervention: 18.38 (3.67) Control: 18.10 (3.77)	To evaluate a school-based intervention to reduce TV, videotape and video game use on adiposity. Designed to have 80% power to detect an effect size of 0.20 or greater/ Based on Bandura's social cognitive theory; 18 × lessons of 30 to 50 min, included self-monitoring of television (TV), video and video-game use, then 10-day turn-off, then 7-hour budget, children taught to become selective	6 months	*n* (intervention follow-up) = 92 *n* (control follow-up) = 100 Three children lost to follow-up in each group. Daily servings of high-fat foods: (adjusted for baseline value, age and sex) adjusted change: –0.82 (95% CI –1.87, +0.23), not significant.	Each household received electronic television time manager (control power to TV and video). Schools were matched.

					viewers and advocators of reducing media use. Parental involvement. Programme built into standard curriculum and taught by classroom teachers trained by research staff. 80% power to detect effect size of at least 0.20.			
DIET AND PHYSICAL EDUCATION STUDIES TO PREVENT OBESITY								
Caballero 2003	RCT Cluster, by school	1	+	**Setting**: Forty-one elementary schools in seven American Indian communities in Arizona, New Mexico, South Dakota, USA. See above.	**Aim:** To evaluate a school-based multi-component intervention to reduce percentage body fat in American Indian children. Power not stated. See above.	3 years	*n* (intervention at follow-up) = 727 *n* (control at follow-up) = 682 17% attrition Completer analyses only. **24-hour recall:** Total daily energy intake significantly lower in intervention compared with control (1892 kcal [7.92 MJ]/day vs. 2157 kcal [9.02 MJ]/day) and % energy from total fat was significantly lower in intervention vs. control (31.1 vs. 33.56%). Actual school-lunch observation confirmed lower fat intake in intervention group but no difference in energy intake between the two groups.	Intervention piloted. Compared with CDC reference values, distribution of BMI in study children was shifter towards higher values. Included family component. School food modification.

Donnelly 1996	CCT By school	2	+	**Setting:** Elementary schools in rural Nebraska, USA. **Participants:** Age 9.2 years. Boys and girls (no values given). See above.	**Aim:** To evaluate a school-based PA and nutrition programme to attenuate obesity and promote fitness. Power not stated. See above.	2 years	At year 2 intervention lunches had significantly less fat and sodium and more fibre but 24-hour recall showed significant differences in intake between groups for sodium only. Authors suggest children compensate in energy intake and PA outside school.	Small rewards for volunteers. School food modification.
Gortmaker 1999	RCT By school	1	+	**Setting:** Ten secondary schools in Boston, USA. **Participants:** Girls and boys, grades 6 and 7, mean age 11.7 (SD 0.7) for both intervention and control; 48% female. See above.	**Aim:** To evaluate impact of school-based health behaviour intervention known as PLANET HEALTH on obesity amongst boys and girls in grades 6 to 8. Implemented programme via school curriculum and existing staff resources. Underpinned by behavioural change and social cognitive theory. Promotion of PA, modification of dietary intake	Two school years	Intervention *n* = 641 Control *n* = 654 17% loss to follow-up Intervention increased fruit and vegetable consumption in girls (0.32 servings/day; 95% CI 0.14, 0.5; *p* = 0.003). Intervention resulted in a smaller daily increment in total energy intake among girls (–575 kJ; 95% CI 1155, 0; *p* = 0.05). Measures of extreme dieting behavior remained unchanged (and low) throughout the intervention and were not different between intervention and control schools. Analysis of girls only using self-	See above.

					(decreasing consumption of high-fat foods, increasing fruit and vegetable consumption) and reduction of sedentary behaviours (with a strong emphasis on reducing TV viewing). Thirty-two classroom lessons of 45-min each over 2 school years. Power limited.		report, showed a reduced risk of using self-induced vomiting, laxatives or diet pills to control weight within the previous 30 days.	
Sahota 2001	RCT Cluster, by school	1	+	**Setting:** Ten primary schools in Leeds, UK. **Participants**: 7–11-year-olds, boys and girls, mean age 8 years. *n* (intervention) = 314 *n* (control) = 322	Assessed the impact of a primary school based intervention which included teacher training, modification of school meals, the development of school action plans targeting the curriculum, physical education, tuck shops, and playground activities. Study powered. See above.		*n* (intervention) = 292 *n* (control follow-up) = 303 (at 1-year follow-up for weight) Children in the intervention group reported higher consumption of vegetables (weighted mean difference 0.3 portions/day, 95% CI 0.2, 0.4), but fruit consumption was lower in obese children in the intervention group (–1.0 portions/day, 95% CI 1.8, –0.2).	See above.

Sallis 2003	RCT Cluster, schools randomised by district	1	+	**Setting:** Twenty-four public middle schools (grades 6 to 8) in San Diego County, California. **Participants:** Mean enrolment across 24 schools was 1109 (SD 356) students per school, of whom 49% were female, 44.5%, were non-white, 39.5% received free or reduced school meals and 36.4% were bussed to school. Mean age and mean baseline BMI not reported.	**Aim:** To evaluate the effects of environmental, policy and social marketing interventions on PA and fat intake of middle school students. The primary aims of the intervention were: 1) increase the total energy expenditure from PA by the student population at school; 2) decrease the grams of total saturated dietary fat purchased or brought to school by students. Power not stated. See above.	Two school years.	Number assessed in each group at follow-up not reported. **Fat intake:** The time by condition interaction term was not statistically significant for total (F = 0.01, p = 0.903) or saturated (F = 0.08, p = 0.781) fat, indicating no differences in change over time by condition in fat measures at the school level. Effect sizes indicated a near null effect for total (d = 0.03) and saturated (d = 0.13) fat. There was no intervention effect on fatty foods consumed.	All 24 schools received an incentive to participate (US$1000 for PE equipment), and intervention schools received an additional US$500 for kitchen equipment and US$2000 for PA programmes or equipment.
Story 2003 GEMS-Minnesota	RCT	1	+	**Setting:** Lunchtime clubs in schools in low income areas, Minnesota, USA. **Participants:** 8–10-year-old	**Aim:** To assess feasibility of obesity prevention programme in African American girls. **Intervention:** Lunchtime clubs in	12 weeks	Intervention n = 26 Control n = 28 Intention to treat analysis No significant difference between groups for dietary intake at 12 weeks.	This study was a pilot study to assess feasibility and was not intended to be sufficiently powered to detect a significant intervention effect. Fully powered studies

				African American girls, at least 25th percentile for age and gender BMI, with a parent willing to be involved. **Mean age (years):** Intervention: 9.3 (SD 0.9) Control: 9.4 (SD 0.9) **Sex:** Girls only Intervention *n* = 26 Control *n* = 28	school designed to improve nutrition, PA and self-esteem through a range of activities. The intervention which was conducted twice per week, focused on increasing healthy eating and PA. Intervention meetings, designed in a 'club meeting' format, were held twice per week for one hour after school at each of the schools used in the study. The intervention was based on social cognitive theory (Bandura) and targeted key points from three domains: 1) environmental factors such as peer support; 2) personal factors such as knowledge and values; 3) behavioural factors such as goal setting and social reinforcement.		% Energy from fat (parental reported) and low-fat food practices (parental reported) were significantly better in intervention group compared with control.	of two of the GEMS pilots are currently underway.

					Control: The control group served as an 'active placebo', non-nutrition/PA condition and focused on promoting positive self-esteem and cultural enrichment. Participants attended monthly Saturday morning meetings (three meetings over 12 weeks). This included arts and crafts; self esteem activities, creating memory books and a workshop on African percussion instruments. Providers of the intervention included University Staff, Trained African American GEMS staff and school staff. Study not powered (pilot).			
DIET AND PHYSICAL EDUCATION STUDIES TO IMPROVE CARDIOVASCULAR HEALTH								
Luepker	RCT	1	+	**Setting:**	Sample size	3 years	Total *n* = 4109 at 3 years (21%	See above.

1996 (CATCH)	Cluster, by school			Ninety-six public state schools in 12 school districts in California, Louisiana, Minnesota and Texas. **Participants:** Mean age 8.76 years. 2461 of 5106 were girls. Total cohort *n* = 5106 at baseline. Ethnically diverse (white, African American and Hispanic).	determined. See above.		dropout for serum cholesterol measurement at 3 years). % Energy intake from fat fell significantly more in intervention school lunches than control (38.7 to 31.9% in intervention vs. 38.9 to 36.2% in control); self reported % daily energy intake from total fat was significantly reduced in intervention (32.7 to 30.3%) compared with control (32.6 to 32.2%, $p < 0.001$) and total energy intake also significantly reduced in intervention schools ($p < 0.01$).	
Manios 1998, 1999, 2002	CCT (by school)	2	+	**Setting**: Schools in Iraklio and Rethimno (intervention) and Chania (control) Crete, Greece. **Participants**: First-grade primary school children aged 5.5 to 6.5 years; 509 boys and 453 girls.	To evaluate a school-based intervention involving a health and nutrition element and a physical fitness and activity element, on chronic disease risk factors. Power not stated. See above.	6 years	Total 831 available at 6 years, 787 assessed (those who did not change schools and completed). Total energy intake change intervention vs. control: +179 kcal (749 kJ) (*n* = 90) vs. +367 kcal [1535 kJ] (*n* = 86), $p < 0.05$. Total fat intake change intervention vs. control: +5.9 g (*n* = 90) vs. +18.8 g (*n* = 86), $p < 0.05$. Saturated fatty acids change	See above.

				See above.			intervention vs. control: +0.8 g (n = 90) vs. +5.1 g (n = 86), p < 0.05.	
Vandongen 1995	RCT Cluster, by school	1	+	**Setting:** Thirty schools in Western Australia. **Participants:** Age range 10–12 years. 1,147 boys and girls See above.	To evaluate programme of fitness and nutrition alone and combined and school and home-based nutrition programmes to improve cardiovascular health. Delivered by teachers and PE teachers who received in-service training sessions. Study powered See above.	Nine months	971 of 1147 assessed at 9 months for blood pressure, anthropometric and fitness tests. Significant decrease in total fat intake in girls compared with boys in school and home nutrition group (2.9, 95% CI 1.5–4.3) and home nutrition group (3.6, 95% CI 2.1–5.1). When adjusted for baseline values only significant decrease in home nutrition group compared with control. Also significant decrease (unadjusted) in saturated fat intake in girls in school and home nutrition group, home nutrition group, fitness and school nutrition group.	All follow-up measures adjusted for baseline values.
Evidence of efficacy (internal validity) for physical activity outcomes								
PHYSICAL ACTIVITY INTERVENTIONS								
Jamner 2004	CCT Cluster by school	2	+	**Setting:** Two public high schools in Orange County, CA, USA. **Participants:** Fifty-eight female adolescents 25 intervention and	**Aim:** To evaluate the effect of a school-based intervention designed to increase PA among sedentary adolescent females. **Intervention:**	Four months	At follow-up, data were available for 25 intervention participants and 22 control participants The intervention had no significant effect on BMI percentile, 67.28 at baseline and 66.74 at 4 months; % body fat 32.64 at baseline and 31.85 at 4 months.	Study participants overall reported more moderate and less light activity at baseline, as these measures were obtained during summer vacation, whereas follow-up assessments were

				22 control Mean age = 14.94 (SD 0.79) years Mean baseline BMI percentile = 67.28 for intervention completers) mean baseline BMI percentile = 60.47 for control completers. 53% non-Hispanic white, 29% Hispanic, 8% Asian and 3% 'other'.	Special PE class. The class met five days per week for 60 min each day (approximately 40 min of activity time). Types of activity included aerobic dance, basketball, swimming and tae bo. One day per week of class time was devoted to a lecture or discussion focusing on the health benefits of PA and strategies for becoming more physically active. Not stated who delivered intervention. Power not stated.		Two-day PA recall data: significant effect of the intervention on light (F = 5.53, p = 0.023), moderate (F = 7.946, p = 0.007) and total (F = 4.155, p = 0 .043) activity. The intervention had a significant effect on lifestyle activity, with the intervention group increasing their mean self-reported lifestyle activity from 2.33 (using the sum of affirmative responses to the Stanford Usual Physical Activity Scale) at baseline to 3.19 at 4 months, whereas the control group showed little change (2.58 at baseline and 2.26 at 4 months).	conducted during the school year which may have confounded results.
Pangrazi 2003	CCT By school Control schools were not	2	+	**Setting:** Thirty-five schools in Arizona, USA. **Participants:** 4th grade, mean age for boys and girls was 9.8 (SD	**Aim:** To evaluate the effects of the PLAY intervention. Promotes 30–60 min moderate to vigorous PA daily, 15-min	12 weeks	At 12-weeks the treatment was effective at increasing the PA level of children, especially girls p < 0.001. All students: PLAY + PE, and PLAY only groups were significantly more active than C.	Previously adopted in Arizona elementary schools and 24,000 children have received the intervention.

	randomly selected			0.6) years. PLAY + PE: *n* = 183 PE only *n* = 175 PLAY only *n* = 150 No treatment control (C) *n* = 91	activity break each day to teach variety of physical activities, promotes attitudes and behaviours to sustain active habits for life; includes self-monitoring and self-awareness. Teachers received training from county health co-ordinators PLAY is not intended to replace comprehensive PE programme but act as important supplement. The intervention comprised three stages: Step 1: promote play behaviour (first week) teachers and students participated, more walking, less standing, sitting, children were informed about the importance of PA and identified appropriate adult role models.		Girls: PLAY + PE, and PE only groups were significantly more active than C. Boys showed no significant differences in steps across treatment groups as the control boys were already more active than average 10-year-old boys in the area (data from previous study).	

					Step 2: teacher directed activities (3 weeks) games and activities that were enjoyable and could be played outside school. Step 3: encourage self-directed activity (8 weeks) with students aiming to achieve 30 min of activity per day independently of teacher outside school. Treatment and PE schools, children received log sheets similar to the PLAY ones but were asked to record their after school activities (active and sedentary). Teachers trained by county co-ordinators, with programme implemented across Arizona with more than 24,000 children receiving PLAY. Power not stated.			

Pate 2005	RCT Cluster by school	1	+	**Setting**: Twenty-four high schools in 14 South Carolina counties, USA. **Participants**: 2744 girls, 48.7% African American and 46.7% white, mean age 13.6 years, mean BMI 23.1 kg/m^2.	To evaluate school-based PA intervention among high school girls. School personnel headed by a champion implemented programme with training from research staff. Power not stated.	Start of 9th Grade through until Spring? Approx. 6 months?	Intervention: *n* = 863 Control: *n* = 741 Completers only Slightly higher % African American girls lost to follow-up. 45% intervention girls vs. 36% control girls reported vigorous PA during an average of one or more 30 min time blocks per day over a 3-day period. However, most girls in both groups reported daily average of at least two 30-min blocks of moderate to vigorous PA at both baseline and follow-up.	
Robinson 1999	RCT Cluster, by school	1	++	**Setting:** Two public elementary schools in San Jose**,** CA, USA. **Participants:** 3rd and 4th grade students, mean age 8.9 years, 192 boys and girls, 45%-49% girls See above.	To evaluate a school-based intervention to reduce television, videotape and video game use on adiposity. Designed to have 80% power to detect an effect size of 0.20 or greater. See above.	6 months	*n* (intervention follow-up) = 92 *n* (control follow-up) = 100 Three children lost to follow-up in each group. Statistically significant decreases in children's reported television viewing and meals eaten in front of the television in intervention group compared with control. PA metabolic equivalent-weighted, min/week (adjusted for baseline value, age and sex) adjusted change: –16.7 (95% CI –78.6, 45.3), not significant.	Each household received electronic television time manager (control power to TV and video). Schools were matched.
Sallis	RCT	1	+	**Setting:**	To evaluate a school-	2 years	Total 549 children assessed at	Interim results only (2

1993, 1997	Cluster, by school			Seven suburban elementary schools in Southern California, USA. **Participants:** Elementary school children, mean age 9.25 years. Seven schools involved, six schools randomly assigned to the three experimental conditions and one further school added to the control group. 85% non-Hispanic white *n* total (intervention and control at baseline) = 745	based intervention involving PE and self-management (delivered either by specialists or teachers) on weight and adiposity. Programme provided by either certified physical education specialist or teachers trained for total 38 hours in-house over 2 years with substitute teachers provided. Power not stated.		follow-up (305 boys and 244 girls); 26% attrition. Boys (after intervention) *n* control = 101, *n* specialist-led = 91, *n* teacher-led = 113. Girls (after intervention) *n* control = 97, *n* specialist-led = 60, *n* teacher-led = 87. No significant groups differences on weekday or weekend PA outside school using accelerometer (no baseline scores available so results unconditional).	year data from 3-year study). Actual data for BMI and skinfold thicknesses is only presented in graphical form.
Schofield 2005	CCT Cluster by school	2	+	**Setting:** Three high schools in central Queensland, Australia. **Participants:** Low active girls (defined from previous study as those girls who	To pilot efficacy of using pedometer as basis of time efficient yet effective non-curriculum school-based programme Intervention; group meetings once a week for 6 weeks for 30 min each in	12 weeks	Pedometer: *n* = 23 Minutes: *n* = 21 Control: *n* = 24 Mean blinded 4-day step count was significantly different only between pedometer vs. control *p* = 0.03, group with participants in both intervention groups significantly increasing step count across 12 weeks (despite pedometer group	

				took least amount of recorded steps); mean age 15.8 years. **BMI (kg/m^2):** Pedometer intervention: 22.3 (SD 4.1) Minutes intervention: 23.7 (SD 6.6) Control 24.5 (SD 5.5)	groups of 8 either before or after school or in lunch break. Intervention groups received log book to record min in PA or amount of step counts. Actual activity intervention was 12-weeks with weeks 7–12 maintenance phase (no group meetings). **Pedometer intervention:** 1000–2000 step increase daily each week until reached 10,000 steps per day. **Minutes intervention:** Increase by 10–15 min daily each week until reached daily average of 30–60 min/day. Power not stated.		showing significant improvement at 6 weeks). No significant changes in moderate or vigorous PA between any groups. Mean increase 2747 steps per day in pedometer group.	
Simon et al. 2004	RCT	1	+	Children in first-level of middle-	**Aim:** To evaluate the	Ongoing trial entitled	The proportion of intervention adolescents not engaged in	Ongoing.

				school (initially aged 11–12 years) in eight schools in Eastern France were recruited, and were randomised to Intervention (I) or Control (C). 954 adolescents were recruited to the study (92% of eligible); 475 in I schools, 479 in C schools.	impact of a PA intervention in adolescents. **Intervention:** The intervention was directed at changing knowledge and attitudes and at providing social support and environmental conditions that encourage PA of adolescents inside and outside school. It is classified here as a school based intervention, it is not strictly school-based but requires numerous partnerships intervening at different levels (school boards, teachers and medical staff, club educators, families, territorial and community agencies in charge of recreational areas and transportation infrastructure, etc).	'Intervention Centred on Adolescents PA and Sedentary Behaviour' (ICAPS) – this paper reports results from first 6 monthsof trial.	organised PA was reduced by 50% after 6 months, whereas it was unchanged among control students. Participation in leisure-organised PA significantly increased among intervention girls (OR 3.38, 95% CI 1.42, 8.05) and boys (OR 1.73, 95% CI 1.12, 2.66), compared with the control group. In addition, high sedentary behaviour (defined as >3 hours/day TV viewing and computer/video games) was reduced in intervention girls (OR 0.54, 95% CI 0.38, 0.77) and boys (OR 0.52, 95% CI 0.35, 0.76) compared with control group.	PA was assessed with a questionnaire adapted from the 'Modifiable Activity Questionnaire for Adolescents'.

					A mean of 10–12 different weekly activities was provided on I sites. About 50% of adolescents participated in at least one weekly activity. The authors reported that implementation increased progressively throughout the school year, thanks to regular individual contacts and more formal meetings (at least one every 2 weeks). Sample size determined.			
DIET AND PHYSICAL ACTIVITY INTERVENTIONS TO PREVENT OBESITY								
Caballero 2003	RCT Cluster, by school	1	+	**Setting**: Forty-one elementary schools in seven American Indian communities in Arizona, New Mexico, South Dakota, USA. **Participants**: Mean age	**Aim:** To evaluate a school-based multi-component intervention to reduce percentage body fat in American Indian children. Almost the entire intervention was	3 years	*n* (intervention at follow-up) = 727 *n* (control at follow-up) = 682 17% attrition Completer analyses only. Self-reported PA levels were higher among intervention compared with control at end of 3 years (both lower than at baseline though).	Intervention piloted. Compared with CDC reference values, distribution of BMI in study children was shifter towards higher values.

				7.6 ± 0.6 years. Sex not reported. See above.	delivered by school personnel, teachers and food service staff; the Pathways staff focused on research measurements and training and support of school staff. Teachers, food service staff and PE teachers trained annually by SPARK or PATHWAYS instructors and supported within schools. Power not stated.			
Donnelly 1996	CCT By school	2	+	**Setting**: Elementary schools in rural Nebraska, USA. **Participants:** Age 9.2 years. Boys and girls (no figures given). 94% White, 42–44% received free and reduced school lunches. **Mean BMI (kg/m^2):** Intervention: 18.3	**Aim**: To evaluate a school-based PA and nutrition programme to attenuate obesity and promote fitness. Utilised school curriculum and existing staff resources. Research nutrition staff consisted of PhD student in nutrition, registered	2 years	PA in the classroom was significantly greater for intervention than control by 6% but PA outside school was significantly less for intervention than control by 16%. Authors suggest children compensate in energy intake and PA outside school.	Small rewards for volunteers.

				(SD 3.9) Control: 18.5 (SD 3.4) Intervention *n* = 102 Control *n* = 236	dietitian, and several graduate students. PA research staff comprised an exercise physiologist and graduate students. Power not stated. See above.			
Gortmaker 1999	RCT By school	1	+	**Setting:** Ten secondary schools in Boston, MA, USA. **Participants:** Girls and boys, grades 6 and 7, mean age 11.7 (SD 0.7) for both intervention and control. See above.	**Aim:** To evaluate impact of school-based health behaviour intervention known as PLANET HEALTH on obesity amongst boys and girls in grades 6 to 8. Power limited. See above.	Two school years	Intervention *n* = 641 Control *n* = 654 17% loss to follow-up Intervention reduced TV hours among both girls (–0.58 hours; 95% CI –0.85, –0.31; $p = 0.001$) and boys (–0.4 hours; 95% CI –0.56, –0.24, $p < 0.001$). Author concludes that reductions in television viewing predicted obesity change and mediated the intervention effect (in girls but not boys). Among girls, each hour of reduction in television viewing predicted reduced obesity prevalence (OR 0.85; 95% CI 0.75, 0.97; $p = 0.02$). Hours per day spent in moderate to	Obesity definition based on BMI and TSF measure greater than or equal to 85th percentile of age and sex-specific reference data statistically accounted for the potential unit of analysis errors. Blinded outcome assessment was reported. Also reported on the issue of the promotion of unintended side effects (extreme dieting behaviours). Schools experienced

							vigorous PA was not significantly different between intervention and control school.	with interdisciplinary curricula found it easier to implement Planet Health material.
Neumark-Sztainer 2003	CCT Cluster, by school	2	+	**Setting:** Six secondary Schools in twin Cities area, school districts Minnesota, USA. **Participants:** 201 females. Mean age 14.9 (SD 0.9) years in intervention, 15.8 (SD 1.1) years in control. BMI (kg/m^2) at baseline: Intervention vs. control: 27.6 (SD 7.2) vs. 25.9 (SD 5.8). Inclusion criteria: girls with BMI at or above 75th percentile *n* (intervention) = 89	To evaluate an obesity prevention programme that aimed to increase enjoyment and self-efficacy In high-school based girls. See above. Delivered by research team, PE teachers and school counsellors. Power not stated.	7-months total, 16-week intervention plus 8-week maintenance plus follow-up 1-month later	*n* (intervention) = 81 *n* (control) = 99. The only significant variable was a progression in PA stage based on the Stages of Change Model (p = 0.004).	See above.

				n (control) = 112				
Sahota 2001	RCT Cluster, by school	1	+	**Setting:** Ten primary schools in Leeds, UK. **Participants:** 7–11 year olds, boys and girls, mean age 8 years. *n* (intervention) = 314 *n* (control) = 322	Assessed the impact of a primary school-based intervention which included teacher training, modification of school meals, the development of school action plans targeting the curriculum, physical education, tuck shops, and playground activities. Sahota used a population approach underpinned by the Health-Promoting Schools philosophy and the intervention involved the whole school community including parents, teachers and catering staff. 80% power to detect difference in means of a normally distributed outcome measure of at least 1.8 standard		*n* (intervention) = 292 *n* (control follow-up) = 303 (at 1-year follow-up for weight) Sedentary behaviour was higher in overweight children in the intervention group weighted mean difference 0.3, (95% CI 0.0–0.7).	89% of the actions points were implemented in the ten schools and changes were made to the food provision. Both parents and teachers were supportive of the dietary education and promotion of PA. Parental questionnaires (64% returned) detailed suggestions for improvements such as promotion of healthier break time snacks with enforcement by school, material on healthy eating for children and fun PA ideas. Of the 20 teachers invited, 19 attended and were satisfied training, resources and materials offered. Children had higher scores for knowledge, attitudes and were positive about the intervention

					deviations at 5% significance level.			in focus groups. APPLES intervention was successful in producing changes at the school level, in terms of changing the ethos of the schools and the attitudes of the children, but had little effect on children's behaviour other than a modest increase in the consumption of vegetables.
Sallis, 2003	RCT Cluster, schools randomised by district	1	+	**Setting:** Twenty-four public middle schools (grades 6 to 8) in San Diego County, CA, USA. **Participants:** Mean enrolment across 24 schools was 1109 (SD 356) students per school, of whom 49% were female, 44.5%, were non-white, 39.5% received free or reduced school meals and 36.4% were bussed to school.	**Aim**: To evaluate the effects of environmental, policy and social marketing interventions on PA and fat intake of middle school students. Delivered by research staff, teachers, school food service staff and managers. Power not stated. See above.	Two school years	Number assessed in each group at follow-up not reported Intervention schools increased PA over time at a greater rate than control schools. Boys in intervention schools increased about equally in PA in PE and out of PE, but girls in intervention schools increased their activity mainly through PE. Survey data revealed that the intervention had no significant impact on reported PA or participation in sedentary behaviours.	All 24 schools received an incentive to participate (US$1000 for PE equipment), and intervention schools received an additional US$500 for kitchen equipment and US$2000 for PA programmes or equipment.

				Mean age and mean baseline BMI not reported.				
Story 2003 GEMS-Minnesota	RCT	1	+	**Setting:** Lunchtime clubs in schools in low income areas, Minnesota, USA. **Participants:** 8–10-year-old African American girls, at least 25th percentile for age and gender BMI, with a parent willing to be involved. **Mean age (years):** Intervention: 9.3 (SD 0.9) Control: 9.4 (SD 0.9) **Sex:** Girls only. Intervention *n* = 26 Control *n* = 28	**Aim:** To assess feasibility of obesity prevention programme in African American girls **Intervention:** Lunchtime clubs in school designed to improve nutrition, PA and self-esteem through a range of activities. The intervention which was conducted twice per week, focused on increasing healthy eating and PA. Intervention meetings, designed in a 'club meeting' format, were held twice per week for one hour after school at each of the schools used in the study. The intervention was based on SCT (Bandura) and targeted key points	12 weeks	Intervention *n* = 26 Control *n* = 28 ITT analysis No significant difference between groups for PA (accelerometer and questionnaire) at 12 weeks.	This study was a pilot study to assess feasibility and was not intended to be sufficiently powered to detect a significant intervention effect. Fully powered studies of two of the GEMS pilots are currently underway.

					from three domains: 1) environmental factors such as peer support; 2) personal factors such as knowledge and values; 3) behavioural factors such as goal setting and social reinforcement. **Control:** The control group served as an 'active placebo', non-nutrition/PA condition and focused on promoting positive self-esteem and cultural enrichment. Participants attended monthly Saturday morning meetings (three meetings over 12 weeks). This included arts and crafts; self-esteem activities, creating memory books and a workshop on African percussion instruments. Providers of the			

					intervention included University Staff, Trained African American GEMS staff and school staff. Study not powered (pilot).			
Warren 2003	RCT Individual	1	+	**Setting**: Three primary schools in Oxford, UK. **Participants**: Children aged 5–7 years (children in Year 1 and Year 2). Sex not reported. See above.	Be Smart was a school and family-based intervention to prevent obesity in children aged 5–7 years. There were four conditions: a nutrition group, a PA group, a combined nutrition and PA group and a control group. The intervention ran for 20 weeks over four school terms (approx. 14 months). Power not stated. See above.	20-week intervention over 14 months	Nutrition intervention at follow-up *n* = 42 PA intervention at follow-up *n* = 42. Combined nutrition and PA intervention *n* = 42. Control *n* = 46. Dropout *n* = 46 for weight Only those who completed were included in analysis (not ITT). Some evidence that PA in playground had improved in the intervention groups but no difference in total activity between groups (including outside school).	See above.
Luepker 1996 (CATCH)	RCT Cluster, by school	1	+	**Setting:** Ninety-six public state schools in 12 school districts in California, Louisiana,	To evaluate a school-based intervention including a home programme for the primary prevention of cardiovascular	3 years	Total *n* = 4109 at 3 years (21% dropout for serum cholesterol measurement at 3 years). Intervention students reported significantly more daily vigorous PA	See above.

				Minnesota and Texas. **Participants:** Mean age 8.76 years 2461 of 5106 were girls. Total cohort *n* = 5106 at baseline. Ethnically diverse (white, African American and Hispanic).	disease. PE specialists and teachers had 1 to 1.5 days of training each school year; training also for cooks and teachers. Sample size determined. See above.		than controls (58.6 vs. 46.5 min, $p < 0.003$).	
Manios 1998, 1999, 2002	CCT By school	2	+	**Setting**: Schools in Iraklio and Rethimno (intervention) and Chania (control) Crete, Greece. **Participants:** First-grade primary school children aged 5.5 to 6.5 years; 509 boys and 453 girls. See above.	To evaluate a school-based intervention, involving a health and nutrition element and a physical fitness and activity element, on chronic disease risk factors. Delivered by school teachers and PE teachers. Power not stated. See above.	6 years	Total 831 available at 6 years, 787 assessed (those who did not change schools and completed). Time in leisure time PA intervention vs. control: +281 (*n* = 356) vs. +174 (*n* = 285) min/week, $p < 0.05$	'Know your body program' also included dental health, drug abuse and accident prevention. Results adjusted for baseline values, sex, BMI, change in height and parental education where appropriate.
Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								

First author	Study design	Research type	Research quality	Study population	Research question and design	Length of follow-up	Main results	Confounders/comments
Smarter Choices – Changing the Way We Travel 2004	Report	N/A	N/A	UK schools	To evaluate alternative modes of transport	N/A	The results of this report suggest that car use can be reduced by 8–15% at engaged schools, but the results are inconsistent. Other benefits may include improved safety and increased awareness of the potential for change in terms of options for alternative modes of transport.	Having a school travel plan coordinator increases the production of school travel plans but there is no evidence that this changes travel patterns or reduces parental fears about traffic danger.
Rowland 2003 Randomised controlled trial of site specific advice on school travel patterns	RCT	N/A	N/A	To evaluate intervention of site-specific advice on school travel patterns	Intervention schools were offered 16 hours of expert assistance over one school year from one of two school travel coordinators who had formal teaching qualifications and road safety experience. Road safety problems and their solutions were identified by meeting with teachers	1 year	Twenty-one London primary schools were randomised. One year post-intervention, nine of eleven intervention schools and none of the control school had travel plans. However, the proportion of children walking,	

					and governors, organising focus groups of parents and pupils, and encouraging the establishment of the school travel working group. The coordinator liaised with relevant parties within the local and health authorities.		cycling, or using public transport on the school journey were similar in intervention and control schools. In the intervention schools, 70% of children walked to school, 24% travelled by car, 6% cycled or used public transport. In the control groups, 71% walked to school, 23% travelled by car, and 7% cycled or used public transport. The proportion of parents who were very or quite worried about traffic danger was similar in the intervention (85%) and control (87%) group. Having a school travel plan coordinator increased the production of school travel plans but there was no evidence that this	

							changed travel patterns or reduced parental fears.	
Department for Education and Skills (2004)	Case study	N/A	N/A		To understand better the influences of re-introduction of National Nutritional Standards for school lunches in 2001 on the provision of food at school lunchtimes.	One time point.	The current National Nutritional Standards for school lunches have failed to promote healthy food choices at lunchtime amongst secondary school pupils in England. In the majority of cases, unrestricted choice of foods at lunchtime was associated with unhealthy food choices. Restricted choice over 1 week (e.g. number of days on which chips were served) was associated with Healthier eating. 82% of schools met all nutritional standards for school meals every lunchtime at the beginning of the service. This had fallen to 47% by	

							the end of service.	
Health Education Trust. A feasibility study into healthier drinks vending in schools (2004)	Feasibility study	N/A	N/A	UK schools	The aim of the feasibility study was to investigate the economic viability of healthier drinks vending provision in secondary schools. Twelve schools participated; schools were chosen to reflect both urban and rural locations and to offer an appropriate mix of size, area and character. The study took a whole school approach. In each school a small working party was set up including senior management, curriculum staff, catering personnel, and representatives from the student council.	N/A	Children will choose healthier options from vending machines, such as mineral water, pure fruit juice and skimmed milk, even when healthy drinks vending machines are set alongside the school's usual vending machine. The key to successful healthy drinks vending is pupil involvement, appropriate location of the vending machine close to the dining area, and continuity of provision (ensuring that the machine is full and in working order).	Evidence of change in total daily consumption of drinks was not assessed. Still awaiting evaluation results from Phase 2. Available at: www.healthedtrust.com
Horne 2004	CBA	2	–	Two inner city schools in London, UK	See above.	See above.	See above.	
James 2004	RCT Cluster by class	1	++	Schools in Christchurch, Dorset, UK.	See above.	See above.	See above.	
Loughridge	CCT	2	+	Secondary	As above.	See above.	See above.	

& Barratt 2005				schools in disadvantaged areas of North Tyneside (north-east of England).				
Metcalf et al. 2005	Cross sectional study – not an intervention	N/A	N/A	154 boys and 121 girls in their first year (aged 4–5 years) at 53 urban primary schools in Avon (part of ALSPAC).	To assess levels of PA of children who walk to school compared with those that are driven. Methods used accelerometry.	N/A	Studied children in urban primary schools in Avon. Being driven to school does not affect the overall PA levels of 5-year-olds. Although the proportion of walkers was highest in the lowest SES group, that pattern of results was unchanged when analysed by each social group. Note: the two groups did not differ significantly in either BMI or sum of skinfold thicknesses.	
Wells & Nelson	CCT	2	+	Primary schools in low to middle	As above.	As above.	As above.	

2005				income areas on the outskirts of London in south-east England.				
Sahota 2001	RCT Cluster, by classroom	1	+	School in Leeds, UK	See above.	See above.	See above.	
Stratton 2000	RCT/CCT Intervention group randomly selected individual children within one school, control children matched from another school.	N/A	N/A	Two schools in an urban industrialised area of north-west England. **Intervention:** 18 boys and 18 girls aged 5 to 7 years. **Control:** 12 boys and 12 girls of similar age, stature and body mass.	To evaluate the effects of moderate to vigorous PA of primary school children of painting a school playground with bright and colourful markings. Playground space 30×30 m in intervention and 40×20 m in control schools, numbers in playground between 50 and 200; neither school had playground markings at baseline. **Intervention group:** Designed the markings which were then painted in bright fluorescent colours on the tar macadam including castle, dragon, pirate ship, fun trial, hopscotch, snakes	4 weeks	Intervention *n* = 27 Control *n* = 20 **No significant difference in BMI (kg/m^2):** Baseline Intervention: 22.9 Control: 22.4 Post-intervention Intervention: 23.3 Control: 22.9 The intervention did increase children's mean heart rate and levels of moderate and vigorous activity with significant interaction between these variables; no main effect differences	

					and ladders, etc., with only one football allowed. **Control:** No markings and limited equipment.		between groups suggesting factors other than playground markings stimulated PA in control school such as availability of skipping ropes and balls (also both schools significantly increased duration of playtime).	
University of East Anglia. A National Evaluation of School Breakfast Clubs (ABC). Department of Health 2001	Various	N/A	N/A	Schools in East Anglia	A survey of breakfast club provision and the structures put in place to implement the scheme. A cluster RCT to evaluate the effectiveness of breakfast clubs in terms of nutritional, social, psychological and educational outcomes. Case studies to generate detailed information about process and structures and the experiences of those involved.	Various.	There is evidence for a small but important beneficial effect of breakfast clubs in schools on behaviour, dietary intake, health, social interaction, concentration and learning, attendance and punctuality. This positive impact is reaching many families whose members are at risk of, or are actually experiencing, social exclusion. Considerable support for	

					A child and family study using questionnaires and semi-structured interviews to collect information from parents about socio-economic circumstances, the impacts of the scheme on families, and parents' and children's satisfaction with and views about breakfast clubs. Both qualitative and quantitative data were generated over three main phases of data collection during Spring Term 2000, Summer Term 2000 and Spring Term 2001. Data were collected from 235 schools operating breakfast clubs. Thirty schools (6000 children) were selected for the trial.		breakfast clubs was found from the interviews and questionnaires.	
Warren 2003	RCT Individual	1	+	Schools in Oxford, UK.	See above.	See above.	See above.	
Woolfe 2005	Review	2	+	Overview of five school-based dietary	To evaluate feasibility and effectiveness of dietary change	See above.	See above.	See above.

				interventions funded by the Food Standards Agency (UK).	interventions in UK school-based settings.			
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question and design**	**Length of follow-up**	**Main results**	**Confounders/comments**
EPPI-Centre (2003b) Children and healthy eating: a systematic review of barriers and facilitators. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.	Systematic review	1	++	Various. *n* = 19 intervention studies.	The aim was to evaluate the effectiveness of interventions to increase 4–10-year-old children's fruit and vegetable consumption, and to assess the barriers and facilitators to having a healthy diet.	Various	Teachers found it difficult to fit nutrition education in to the curriculum. They also felt they lacked in skills, training and support to deliver high quality nutrition lessons. However, fruit tuck shops could be valuable to others areas of learning, such as English and art through promotion exercises, and maths via the handling of money. Success of the interventions seemed to depend to a large extent on the enthusiasm of staff and parents.	
EPPI-Centre, (2001a)	Systematic review	1	++	Various. *n* = 7 intervention studies.	The aim was to evaluate the	Various.	Intervention was well received in most cases, although a recurring theme was that schools lacked the time and resources for such	

Young people and healthy eating. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.					effectiveness of interventions to improve the diets of young people (aged 11–16 years), and to assess the barriers and facilitators to having a healthy diet.		projects. One study noted that young women tended to enjoy the intervention more than young men, and that peer leaders were particularly well received. One intervention met with resistance from teachers and waning enthusiasm from students and parents. In this case, more training for the teachers may have provided more motivation, enthusiasm and skill. Young people's views of barriers and facilitators to healthy eating indicated that effective interventions would: 1) make healthy food choices accessible, convenient and cheap in schools; 2) involve family and peers; 3) address personal barriers to healthy eating, such as preferences for fast food in terms of taste, and perceived lack of will-power.	
EPPI-Centre (2003a) Children and physical activity: a systematic review of barriers and	Systematic review	1	++	Various. *n* = 5 intervention studies (all US-based).	The aim was to evaluate the effectiveness of interventions to increase PA/reduce	Various	In one study, 95% teachers rated the intervention as effective and 65% pupils said they liked the intervention lessons. In another, teachers reported high levels of participation, confidence in the intervention and confidence in themselves to be able to deliver it. Another intervention met with more resistance from school staff, and waning enthusiasm from	

facilitators. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.					inactivity in children aged 4–10 years, and to assess the barriers and facilitators to their participation in PA.		parents. Interventions should address the barriers and facilitators to participation in PA identified by children, by: 1) providing activities that are enjoyable, in a social atmosphere, giving children some choice, and making children aware of how sedentary activities such as TV watching are; 2) involving parents in interventions; 3) improving children's access to PA opportunities.	
EPPI-Centre (2001b) Young people and physical activity: A systematic review of research on barriers and facilitators. London: EPPI-Centre, Social Science Research	Systematic review	1	++			Various	Enthusiasm for the project amongst staff, parents and pupils varied. The main barrier to implementation was a lack of time and resources. In some schools, though, the intervention measures were well received. Adequate training for teachers expected to give nutrition information is important. Young people's views on barriers and facilitators suggest that interventions should: 1) modify PE lessons to suit their preferences; 2) involve family and peers, and make PA a social activity; 3) increase young people's	

Unit, Institute of Education, University of London							confidence, knowledge and motivation relating to PA; 4) make physical activities more accessible, affordable and appealing to young people.	
James 2004	RCT Cluster by class	1	++	See above.	See above.	See above.	One of the authors delivered the intervention.	Average class size was 22 (SD 5).
Loughridge & Barratt 2005	CCT	2	+	As above.	As above.	As above.	Focus groups were conducted in the control school only, and revealed that students viewed their existing water provision as poor, and wanted sufficient supplies of cooled filtered water at school. Implementation would appear simple, and sustainable (my comments).	
Horne 2004	CBA	2	–	See above.	See above.	See above.	Research staff and school staff. No details.	
Wells & Nelson 2005	CCT	2	+	As above.	As above.	As above.	9% of parents of infants who received free school fruit were not aware that their child did so; conversely 40% of parents of junior children who used to receive free fruit at school were not aware that their child no longer did so. The parents of 483 infant pupils who believed (correctly) that their child was receiving free school fruit were asked a question about	

							whether or not they had changed the amount of fruit they gave to the child. The majority (82%) reported not having changed the amount of fruit they provided for their child.	
Sahota 2001	RCT Cluster, by classroom	1	+	See above.	See above.	See above.	Delivered by teachers but the project team provided training for teachers and the project manager also provided input and support.	
Warren 2003	RCT Individual	1	+	See above.	See above.	See above.	The project team delivered the intervention.	

SEARCH STRATEGIES

1. exp OBESITY/
2. exp Weight Gain/
3. exp Weight Loss/
4. obes$.ti,ab.
5. (weight gain or weight loss).ti,ab.
6. (overweight or over weight or overeat$ or over eat$).ti,ab.
7. weight change$.ti,ab.
8. ((bmi or body mass index) adj2 (gain or loss or change)).ti,ab.
9. body mass.ti,ab.
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
11. exp Behavior Therapy/
12. exp Social Support/
13. exp Family Therapy/
14. exp Psychotherapy, Group/
15. ((psychological or behavio?r$) adj (therapy or modif$ or strateg$ or intervention$)).ti,ab.
16. (group therapy or family therapy or cognitive therapy).ti,ab.
17. ((lifestyle or life style) adj (chang$ or intervention$)).ti,ab.
18. counsel?ing.ti,ab.
19. social support.ti,ab.
20. (peer adj2 support).ti,ab.
21. (children adj3 parent$ adj therapy).ti,ab.
22. 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21
23. exp OBESITY/dh [Diet Therapy]
24. exp Diet, Fat-Restricted/
25. exp Diet, Reducing/
26. exp Diet Therapy/
27. exp FASTING/
28. diet$.ti,ab.
29. (low calorie or calorie control$ or healthy eating).ti,ab.
30. (fasting or modified fast$).ti,ab.
31. exp Dietary Fats/
32. (fruit or vegetable$).ti,ab.
33. (high fat$ or low fat$ or fatty food$).ti,ab.
34. formula diet$.ti,ab.
35. 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32 or 33 or 34
36. exp EXERCISE/
37. exp Exercise Therapy/
38. exercis$.ti,ab.
39. (fitness adj (class$ or regime$ or program$)).ti,ab.
40. (aerobics or physical therapy or physical training or physical education or physical activity or physical inactivity).ti,ab.
41. dance therapy.ti,ab.
42. sedentary behavio?r.ti,ab.
43. 36 or 37 or 38 or 39 or 40 or 41 or 42
44. exp Complementary Therapies/
45. (alternative medicine or complementary therap$ or complementary medicine).ti,ab.
46. (hypnotism or hypnosis or hypnotherapy).ti,ab.
47. (acupuncture or homeopathy or homoeopathy).ti,ab.
48. (chinese medicine or indian medicine or herbal medicine or ayurvedic).ti,ab.
49. 44 or 45 or 46 or 47 or 48
50. ((diet or dieting or slim$) adj (club$ or organi?ation)).ti,ab.
51. (weightwatcher$ or weight watcher$).ti,ab.
52. (correspondence adj (course$ or program$)).ti,ab.
53. (fat camp$ or diet$ camp$).ti,ab.
54. 50 or 51 or 52 or 53
55. exp Health Promotion/
56. exp Health Education/
57. (health promotion or health education).ti,ab.
58. (media intervention$ or community intervention$).ti,ab.
59. health promoting school$.ti,ab.

60. ((school or community) adj2 program$).ti,ab.
61. (family intervention$ or parent$ intervention).ti,ab.
62. (parent$ adj2 (behavio?r or involve$ or control$ or attitude$ or educat$)).ti,ab.
63. 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62
64. exp Health Policy/
65. exp Nutrition Policy/
66. (health polic$ or school polic$ or food polic$ or nutrition polic$).ti,ab.
67. 64 or 65 or 66
68. exp OBESITY/pc [Prevention & Control]
69. exp Primary Prevention/
70. (primary prevention or secondary prevention).ti,ab.
71. (preventive measure$ or preventative measure$).ti,ab.
72. (preventive care or preventative care).ti,ab.
73. (obesity adj2 (prevent$ or treat$)).ti,ab.
74. 68 or 69 or 70 or 71 or 72 or 73
75. exp Controlled Clinical Trials/
76. exp Random Allocation/
77. exp Double-Blind Method/
78. exp Single-Blind Method/
79. exp PLACEBOS/
80. exp *Research Design/
81. exp Intervention studies/
82. exp Evaluation studies/
83. exp Cost Benefit Analysis/
84. (time adj series).tw.
85. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask)).ti,ab.
86. exact{CONTROLLED-CLINICAL-TRIAL}.pt.
87. placebo$.ti,ab.
88. (matched communities or matched schools or matched populations).ti,ab.
89. (control$ adj (trial$ or stud$ or evaluation$ or experiment$)).ti,ab.
90. (comparison group$ or control group$).ti,ab.
91. matched pairs.ti,ab.
92. (outcome study or outcome studies).ti,ab.
93. (quasiexperimental or quasi experimental or pseudo experimental).ti,ab.
94. (nonrandomi?ed or non randomi?ed or pseudo randomi?sed).ti,ab.
95. randomi?ed.hw.
96. (cohort or survey: or qualitative).ti,ab.
97. 75 or 76 or 77 or 78 or 79 or 80 or 81 or 82 or 83 or 84 or 85 or 86 or 87 or 88 or 89 or 90 or 91 or 92 or 93 or 94 or 95 or 96
98. exp Meta-Analysis/
99. meta-analys$.ti,ab.
100. metaanalys$.ab,ti.
101. meta analys$.ab,ti.
102. Cochrane.ab,sh,ti.
103. (review$ or overview$).ti.
104. review$.pt.
105. (synthes$ adj3 (literature$ or research or studies or data)).ab,ti.
106. pooled analys$.ab,ti.
107. ((data adj2 pool$) and studies).mp. [mp=title, original title, abstract, name of substance, mesh subject heading]
108. ((hand or manual or database$ or computer$) adj2 search$).ab,ti.
109. ((electronic or bibliographic$) adj2 (database$ or data base$)).ab,ti.
110. ((review$ or overview$) adj10 (systematic$ or methodologic$ or quantitativ$ or research$ or literature$ or studies or trial$ or effective$)).ab.
111. 98 or 99 or 100 or 101 or 102 or 103 or 104 or 105 or 106 or 107 or 108 or 109 or 110
112. (retrospective$ adj2 review$).ab,sh,ti.
113. (case$ adj2 review$).ab,sh,ti.
114. (record$ adj2 review$).ab,sh,ti.
115. (patient$ adj2 review$).ab,sh,ti.
116. (patient$ adj2 chart$).ab,sh,ti.
117. (peer adj2 review$).ab,sh,ti.
118. (chart$ adj2 review$).ab,sh,ti.
119. (case$ adj2 report$).ab,sh,ti.

120. (rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep).ab,sh,ti.
121. 112 or 113 or 114 or 115 or 116 or 117 or 118 or 119 or 120
122. 121 not (121 and 111)
123. 111 not 122
124. 22 or 35 or 43 or 49 or 54 or 63 or 67 or 74
125. 10 and 124 and 97
126. 10 and 124 and 123
127. 125 or 126
128. animal/
129. human/
130. 128 not (128 and 129)
131. 127 not 130
132. limit 131 to yr=1990–2004
133. exp CHILD/
134. exp ADOLESCENT/
135. exp INFANT/
136. (child$ or adolescent$ or infant$).af.
137. (teenage$ or young people or young person or young adult$).af.
138. (schoolchildren or school children).af.
139. (pediatr$ or paediatr$).af.
140. (boys or girls or youth or youths).af.
141. 133 or 134 or 135 or 136 or 137 or 138 or 139 or 140
142. 132 and 141

DATA SOURCES

AMED
ASSIA
British Nursing Index
CAB Abstracts
CENTRAL (Cochrane Controlled Trials Register)
CINAHL
Clinical Evidence - http://www.clinicalevidence.org
Cochrane Database of Systematic Reviews
CRD (EED database) http://www.york.ac.uk/inst/crd
DARE
Embase
EPPI-Centre - http://eppi.ioe.ac.uk/
ERIC
Food Standards Agency - http://www.food.gov.uk/science/research/
HDA Evidence Base - http://www.hda-online.org.uk/html/research/effectiveness.html
Health Evidence Bulletins – Wales - http://hebw.cf.ac.uk
HealthPromis
IUHPE (International Union for Health Promotion and Education) - http://www.iuhpe.nyu.edu/pubs/index.html
Medline
NCCHTA - http://www.ncchta.org
NICE – www.nice.org.uk
Public Health Effectiveness (Hamilton, Ontario) - http://www.health.hamilton-went.on.ca/CSCARB/EPHPP/ephpp.htm
PsycINFO
SIGN – http://www.sign.ac.uk
Social Science Citation Index (equiv. to Current Contents)
Sociological Abstracts
Sport Discus

For the update search (December 2005) Medline, Cinahl, PsychINFO and Embase were searched.

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Bollella MC, Spark A, Boccia LA, Nicklas TA, Pittman BP, Williams CL. Nutrient intake of Head Start children: Home vs. school. *Journal of the American College of Nutrition*; 1999;18(2):108–14.	Not schools-based – included in 2–5-year-olds and family.
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Cairella G, Romagnoli F, Cantarelli P, Valentini P, Tarsitani G. School oriented intervention on dietary education: results of phase 1. *International Journal of Obesity* 1998;22:S254 (Abstract).	Abstract only.
Carrel AL, Clark RR, Peterson SE, Nemeth BA, Sullivan J, Allen DB. Improvement of fitness, body composition, and insulin sensitivity in overweight children in a school-based exercise program: A randomized, controlled study. *Archives of* P*ediatrics and Adolescent Medicine* 2005; 159**:**963-968	All obese at baseline.
Coleman kJ, Tiller CL, Sanchez J, Heath EM, Sy O, Milliken g et al. Prevention of the epidemic increase in child risk of overweight in low-income schools: the El Paso coordinated approach to child health. *Archives of Pediatrics and Adolescent Medicine* 2005;159(3):217–24.	Re CATCH – study included.
Chomitz VR. Promoting healthy weight among elementary school children via a health report card approach. *Archives of Paediatrics and Adolescent Medicine* 2003; 157(8): 765-772	6 weeks.
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prevention of children's behaviour disorders. *Journal of Pediatrics* 1996;129(1):136–139.	
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Dennison BA, Russo TJ, Burdick PA, Jenkins PL. An intervention to reduce television viewing by preschool children. *Archives of Pediatrics and Adolescent Medicine* 2004;158(2):170.	Not schools-based – included in 2–5-year-olds and family.
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Journal of Adolescent Health 31(2)*:*125–32.	
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Department of Health. NOP Survey (A study into parents and teachers views of the National School Fruit Scheme) (2003). Available at: www.dh.gov.uk	Superseded by Metcalf 2005 that contains consumption data.
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Talvia S, Lagstrom H, Rasanen M, Salminen M, Rasanen L, Salo P et al. A randomized intervention since infancy to reduce intake of saturated fat. *Archives of Pediatrics and Adolescent Medicine* 2004;158(1):41.	Re STRIP – included in 2–5-year-olds and family.
Tershakovec AM, Jawad AF, Stallings VA, Zemel BS, McKenzie JM, Stolley PD, Shannon BM. Growth of hypercholesterolemic children completing physician-initiated low-fat dietary intervention. *Journal of Pediatrics* 1998;133(1):28–34.	Hypercholesterolaemic children.
The Water Provision pilot project. 2004 Department of Health Access: www.dh.gov.uk	Superseded by Loughridge 2005.
Treuth MS, Sunehag AL, Trautwein LM, Bier DM, Haymond MW, Butte NF. Effects of strength training on intra-abdominal adipose tissue in obese prepubertal girls. *Medicine and Science in Sport and Exercise* 1998;30:1738–43.	In England but in obese girls .
Williams CL, Spark A, Strobino BA, Bollella MC, D'Agostio CA, Brotanek J et al. Cardiovascular risk reduction in a preschool population: The Healthy Start Project. *Preventive Cardiology* 1998;2:45–55.	Not schools-based – included in 2–5-year-olds and family.
Williams CL, Squillace MM, Bollella MC, Brotanek J, Campanaro L, D'Agostino C et al. Healthy Start: A comprehensive health education program for preschool children. *Preventive Medicine* 1998;27:216–23.	Not schools-based – included in 2–5-year-olds and family.
Williams CL, Strobino BA, Bollella M, Brotanek J. Cardiovascular risk reduction in preschool children: The 'Healthy Start' Project. *Journal of the American College of Nutrition* 2004;23(2):117–23.	Not schools-based – included in 2–5-year-olds and family.

Appendix 8

Workplace interventions to prevent obesity

EVIDENCE SUMMARY TABLES

1. BEHAVIOUR MODIFICATION/EDUCATION TECHNIQUES – INCLUDING HEALTH CHECKS AND WORKPLACE-MONITORED DIETS

SUMMARY

Evidence of efficacy for weight management/reduction

Evidence from ten randomised controlled trials (RCTs) and one controlled non-randomised trial (CCT) suggest that worksite behaviour modification programmes such as health screening (a 'health check') followed by counselling can result in short-term weight or body fat loss although there was a tendency for weight regain post intervention.

Reductions in body mass/body fat relative to control were noted in eight of the RCTs (Rose 1983 ; Brownell 1985 ; Peterson 1985; Shannon 1987 [data from Erfurt 1991; Gomel 1993 ; Gemson 1995; Hennrikus 1996; Proper 2003]; and one CCT (Cockcroft 1994). There was a wide range of results for the amount of weight lost. The two older studies reported reductions of about1 lb (2.2 kg) per week (Peterson 1985; Shannon 1987 [data from Hennrikus 1996), with a tendency to regain weight for those studies where this was followed up for 6–12 months post intervention (Brownell 1985; Shannon 1987; Gomel 1993). An extended UK-based RCT (Rose 1983) found very small weight reductions in intervention subjects (–0.4% in all men (n = 9734) and –0.7% in those at high cardiovascular risk (n = 1278) over 5–6 years. A non-randomised UK trial with a weak study design (CCT; Cockcroft 1994) found that those in the advice grou$p$ lost more weight than those in the control group (p = 0.025 for time and advice measures).

A recent UK-based individual RCT looking at a single health check with 5-month follow-up (Hanlon 1995) found no significant difference in body mass index (BMI).

One weak RCT among male blue collar workers in Belgium (Braeckman 1999) resulted in an increase in BMI in the intervention compared with the control group despite reported reduction in energy and percent fat intake.

Evidence of efficacy for diet/physical activity outcomes

There is evidence from a systematic review of trials and six additional RCTs that worksite behaviour modification programmes can lead to improvements in nutrition and physical activity (PA). Evidence of longer term, post intervention benefits is limited.

Nutrition: A systematic review (Janer 2002) found that worksite behaviour modification programmes can show a positive effect on dietary fat intake (ranging from a decrease of 3% to an increase of 1.3% in energy from fat. Programmes can also result in an increase in the consumption of fruit and vegetables, ranging from 0.09 to 0.5 servings per day. Information about long-term effects was limited. The percentage of favourable change maintained at 6 or 12 months with regard to nutrition ranged from 0% to 65%. Successful programmes included a wide range of educational interventions (such as health screening followed by counselling) sometimes accompanied by environmental changes.

Four RCTs with nutrition outcomes were not included in, or were published since, this systematic review. Three RCTs (Sorensen 1996 ; Sorensen 1998; Sorensen 1999) found significant improvements in nutrition and one showed no benefit (Sorensen 2002). Only one trial monitored post intervention effects 1 year after the 2-year intervention (Sorensen 1996) and noted significant decreases in fat intake and increases in fruit and vegetable intake. It appeared from this study that longer, interactive intervention efforts (contests and classes) resulted in more positive outcomes than one-time activities (such as the kickoffs) or more passive efforts (use of printed materials).

Physical activity: There is systematic review evidence (Janer 2002) suggesting significant effects of educational sessions and informative materials on levels of PA. Information on the type of PA in each trial is not provided in the review. Out of nine trials using educational sessions and informative materials, and evaluating outcomes directly related to PA, four reported significant changes. One trial comparing both types of intervention found better results with educational activities focusing on behavioural changes, with 65% of at risk employees exercising weekly, compared with 50% when facilities were offered. Motivationally tailored intervention appeared to be more effective in nearly all the stages of readiness.

Two RCTs not included in, or published since this systematic review noted significant increases in PA in the intervention group (Emmons 1999) or significant increases in both intervention and control groups but no significant difference between groups (Nichols 2000). Only the latter trial had post-intervention follow-up (Nichols 2000; 6 months).

Evidence of corroboration in the UK

Of four intervention studies carried out in the UK (Rose 1983; Hanlon 1995; Cockcroft 1994; Leslie 2002) three (Cockcroft, Leslie and Rose) suggested benefits. In one UK study, individual health checks did not generate threat for most of the participants although the results for weight loss were not significant (Hanlon 1998). In a study addressing barriers to change, men chiefly cited a lack of nutritional information as a barrier to change while women predominantly cited the preferences of family members (Fleming 1997 [4]). Finance was not a factor in this particular study. A single set of case studies suggest that the more successful interventions include an interdisciplinary approach with broad representation including: health and safety and human resources, and implementers from high grades and strategic positions; initiatives integrated into worksite objectives; staff involvement, communication and realistic objectives; activities that go beyond the superficial and address root causes (Health Development Agency 2002).

EVIDENCE TABLE 1: BEHAVIOUR MODIFICATION/EDUCATION TECHNIQUES – INCLUDING HEALTH CHECKS AND WORKPLACE-MONITORED DIETS

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
Hanlon 1994, Hanlon 1995	Individual RCT	1	++	Two workplaces in Scotland; one with internal control (engineering factory) and one serving as external control. *n* = 1371 (of 1632 selected). Mean age 44 years. 89% male	**Aim:** To determine the effectiveness of a health check and assess any particular benefits resulting from feedback of plasma cholesterol concentration or coronary risk score or both. Multi-factorial. Single individual healthcheck with trained counsellor giving feedback on blood cholesterol and risk score. 80% power at *p* = 0.05.	Single health check with 5 month follow-up	86% participation. Low attrition: 17% in intervention, 14% in control. No significant difference for BMI between full health check group and internal control (*p* = 0.16). No differences between groups to suggest that feedback of cholesterol concentration or risk score had additional impact on any of the outcomes.	**Health check:** No details of dietary content and diet assessment by self-reported change. Feasibility depends on resources for individual counselling.
Proper 2003	Cluster RCT	1	+	Three municipal services in Enschede, Netherlands. *n* = 299	**Aim:** To investigate effectiveness of an individual counselling intervention at the workplace. Seven	Nine months.	52% recruitment rate. 66% attended six or seven consultations. Significant reduction in % body fat (–0.79% [95% CI –1.43, –	PACE programme. No allocation concealment. No intention to treat (ITT).

				Mean age approx. 40 years. Approx. 65% highly educated. 25.6% female in intervention and 38.5% female in control group.	individual counselling sessions over 9 months to promote PA and nutrition changes plus written information vs. written information only (control). 90% power at $p = 0.05$.		0.16]; $p = 0.015$).	81% health test completion in intervention but only 70% in control group. Post-intervention effects unknown. Generalisable to motivated individuals. Complex and confusing paper.
Gomel 1993	Cluster RCT	1	+	Australian ambulance service. 28 Worksites $n = 488$ 83% male. Mean age 31–33 years.	**Aim:** Comparative efficiency of four programmes designed to decrease cardiovascular risk factors: Health risk appraisal (HRA) with feedback (30 mins); health education (HE) with standard advice (50 mins); behavioural counselling plus HRA and HE (>2 hours over 10 weeks); or all above plus incentives (e.g. lottery draw).	3 and 6 months, and 1 year.	88% participation. Recruitment = 431. 84% follow up at 12 months. BMI increased significantly over four assessments. Increase was on average 4% less for programmes including behaviour modification techniques ($p = 0.04$). Initially significant decrease in % body fat in these groups (when compared with programmes without behaviour counselling, $p = 0.02$) had returned to baseline levels at end of 12 months.	RCT – cluster + No allocation concealment but intention to treat (ITT) analysis.
Peterson	Individual	1	+	High tech	**Aim:**	16 week	80% attrition with professional	Individual but

1985	RCT			manufacturer. Blue collar industry Massachusetts. *n* = 63 24% male Mean percent over ideal weight 36.6% Average age 46.2 years Assembly line workers *n* = 36 Plant managers *n* = 10 Clerical *n* = 5 Unknown *n* = 12	To evaluate weight loss programmes led by volunteers compared with those led by professionals. 12 sessions.	program me plus 4-month follow-up.	leaders, 48% with volunteer leaders. If just completers, professionally led groups lost weight at a faster rate. Overall weight loss for both interventions including dropouts was 3.3 kg (7.3 lb). If just completers there was an overall weight loss of 8.5 kg (18.7 lb). No significance values stated. Professionally led – cost per kg lost index of US$7.88 and US$12.55 at post-test and follow-up respectively. In self-help condition, cost per kg lost index of US$4.38 and US$5.56 at post-test and follow-up.	stratified randomisation based on degree of overweight. Small study and no baseline data provided. No allocation concealment but ITT analysis. High attrition.
Rose 1983	Cluster RCT	1	+	Twenty-four factories (matched as far as possible for size, nature of industry and region, then one in each pair was randomly assigned to intervention condition). UK	**Aim:** To find out how far health education can change the major coronary risk factors in a population. Advice from factory medical departments about cardiovascular risks. Intensive advice for 13% of the population at high risk. Specific	5 or 6 years	5% of intervention site workforce re-examined per annum. The same 10% in control sites analysed biennially. Very small weight reductions in intervention subjects (–0.4% in all men (*n* = 9734) and –0.7% in those at high cardiovascular risk (*n* = 1278), after 5–6 years. No significance values stated.	No allocation concealment. Analysed by cluster (5% of workforce per annum) therefore ITT analysis not possible.

				18,210 men 40–59 years old	interventions for weight loss (for those >15% overweight (medical staff supplemented a little by a central visiting team).			
Shannon 1987	Assessed by Hennrikus 1996 systematic review. – considered an RCT with partial randomi-sation			**Site one:** Petroleum refinery **Site two:** Chemical plant – both parts of Atlantic Richfield. Forty-seven blue collar from site one, 56 white collar from site two. Wait list control comparison group.	To evaluate the effectiveness of a programme to promote weight loss and improve participant health behaviours and knowledge of nutrition.	Nine-week interventi on plus 1-year follow-up.	103/115 participants (89%). 61% in treatment group completed programme. 84% control group had post-test data. Gender and site not related to weight loss. Weight loss in treatment grou*p* (mean 0.94 lb [0.43 kg] per week) significantly greater than control. At 1-year follow-up (data on 14 of 32 completers only), six had maintained weight, four had regained some but not all weight and four had continued to lose.	Original paper unavailable. Data extracted from Hennrikus 1996 .
Erfurt 1991	RCT	1	+	Four manufacturing plants, Michigan USA. Mean age 39–43 years 32–36% were above ideal weight	**Aim:** To compare effectiveness of four models at controlling high blood pressure, obesity and cigarette smoking. 1) Control, Health risk appraisal *n* = 2448.	3 years	Sample of 600 selected for re-screening (500 in site 4). 80–84% re-screened. For those employees overweight by 20% or more at baseline, significant differences across sites in mean weight change. Major improvements in risk levels were found with the addition of routine follow-up	Treated as RCT by Janer 2002. No allocation concealment and no ITT though 75–88% of employees screened at baseline and 80–84% re-screened at follow-up.

				In re-screened sample 87–95% were male, and mean age was 43.7–46.3 years. 66–78% white.	2) As 1) plus media promotion, health improvement classes *n* = 1374. 3) As 2) plus support, encouragement *n* = 2089. 4) As 3) plus activities in worksite *n* = 1893.		counselling and a menu of interventions. Sites one and two showed gains (+3.1 and +0.6 lb [+1.41 and +0.27 kg]) and mean reductions in sites three and four (–1.2 and –4.7 lb [–0.54 and –2.13 kg]) ($p < 0.001$). Average weight gain in site one and weight loss in site four statistically significant ($p < 0.01$ and $p < 0.001$).	
Gemson 1995	Individual RCT	1	+	Large financial services firm in New York City. 161 employees who volunteered by a periodic health examination. 81% male. Mean 46.2 years old in health risk appraisal (HRA) and 46.5 in control. 81% white. 50% with College/professional degree in HRA and 60% in control group.	All the volunteers received a physical examination by a registered nurse and completed a questionnaire. Half were then randomised to receive a computerised HRA with counselling. Controls received no report or counselling. No power calculation reported.	Baseline examination and feedback. 6-month follow-up.	53% re-attended in HRA group and 59% in control group. There were no significant differences in weight between the two groups but a trend towards an improvement in the HRA group.	No allocation concealment. No ITT analysis. Poor follow-up.
Cockcroft 1994	CCT	2	+	London teaching hospital. 297	Volunteers who completed the	Baseline screenin	28% re-attended.	Treat as *very weak* CCT.

				volunteers to an invitation to attend a health screening session run by the occupational health/health psychology units. No socio-economic data provided.	screening questionnaire and health measurements were assigned to results only (control) or to receive advice and set targets for changing their lifestyle (intervention).	g and advice. 6-month follow-up.	Those in the advice group lost more weight than those in the control group (BMI [kg/m^2] in advice group was 24.90 at baseline and 24.36 at follow-up, vs. 24.48 at baseline and 24.49 at follow-up in the controls); p = 0.025 for time and advice measures.	UK-based but no allocation concealment, no baseline data, No ITT and poor follow-up.
Braeckman 1999	RCT	1	+	Four worksites in Gent Belgium. n = 928 100% men, average age 43.7 (range 35–59) years Reported as predominantly blue collar and White.	**Aim:** To evaluate the effect of a short-term, low intensity nutrition intervention on blood lipids, nutrition knowledge and dietary changes. Individual health check with risk feedback, plus mass media and educational sessions. Control group received a written summary of their results without further information or advice although referred to GP if abnormal values.	3 months	Baseline response 83% (n = 770). Follow-up response 82% of baseline respondents (n = 638). A net reduction in the intake of total energy and the percentage of energy from total fat was reported in the intervention group (–1.42 kcal [5.95 kJ]/day and –1.56% respectively; $p < 0.05$ in both cases) but BMI increased by 0.26 kg/m^2 ($p < 0.001$) compared with control.	No allocation concealment. Small study (only four sites randomised) and some modest baseline differences. No ITT but >82% follow-up.
	Individual RCT	1	+	Department store workers who	**Aim:** To evaluate the	End of 16-week	57.5% attrition in study 1, 42.6% in 2 and 33.8% in 3.	Individual but stratified

				were Union members. New York City, USA. Lower-middle class socioeconomic status (SES). 100% women. *n* = 172 (40 in study 1, 61 in study 2, 71 in study 3). No difference between studies or treatment groups in mean age, weight, or percentage overweight.	effectiveness of three consecutive weight loss programmes of lay vs. professional group leaders, frequent (four × weekly in study one, three × weekly in studies 2 and 3) vs. once weekly meetings, and programmes on/off site.	program me plus 6 months later (study 1) or 1 year later (studies 2/3).	(Attrition rates lower for groups with frequent meetings.) Attrition rates in study 1 lower in groups led by lay therapists (31 and 50%) than professional (75 and 80%) ($p < 0.05$) and in frequent treatment groups (31 vs. 50%, 75 and 82%) ($p < 0.05$). Average weight loss for all subjects completing treatment in study one at 16 weeks was 3.6 kg and at 6 months, 1.2 kg. No significant difference between groups. Post-treatment mean weight loss in study 2 was 9.2 lb (4.17 kg), and 8.6 lb (3.90 kg) at 1-year follow-up. In study 3 weight loss was 7.3 lb (3.31 kg) at post treatment, and 5.9 lb (2.68 kg) at 1-year follow-up. Attrition, weight loss and maintenance similar in lay and professionally led groups in studies 2/3, but costs per pound loss per participant was US$6.35 for the lay leaders and US$18.81 for the professional. No significance values stated.	randomisation based on degree of overweight. No allocation concealment. No ITT analysis. Incorporates Stunkard 1980

Evidence of efficacy (internal validity) for diet/physical activity outcomes								
Janer 2002	Systematic review	1	+	Literature search date unknown (circa 1984–2000) and Medline+ reference list only. Forty-five controlled studies. Fourteen controlled trials with a nutrition outcome and 13 controlled trials with a PA outcome were included .	Review of workplace health promotion trials re major cancer risk factors (diet, obesity and PA amongst other topics). Studies included an educational intervention (such as health screening followed by counselling) and, sometimes, environmental changes.	Various	**From 14 controlled trials with a nutrition outcome:** The increase in vegetable servings per day was reported in three trials and ranged from 0.09 to 0.19. Five studies evaluated fruit intake and four of these obtained statistically significant increases ranging from 0.11 to 0.24 servings per day. In the three studies reporting both fruit and vegetable use, increases ranged from 0.18 to 0.5 servings per day. Changes in fat intake were statistically significant in six of the ten available studies. The magnitude of the change ranged from a decrease of 3.0% to an increase of 1.3% in energy from fat. Five studies included more than one period of follow-up. The percentage of favourable change maintained at 6 or 12 months with regard to the intake increase or reduction ranged from 30 to 65%. **From 13 controlled trials with a physical activity outcome:** Out of nine trials using educational sessions and	Unfocused review question and wide range of types of intervention and outcomes covered. Errors in paper (reference numbers missing in text). Overlap with other reviews and topics – incentives, PA, etc. NB: Shephard 1992 is a case study looking at a PA initiative – see excluded studies. Two studies cited in an older systematic review Roe 1997 are not included: Hanlon 1995 /Hanlon 1994 [17] and Rose 1983 /Bauer 1985. Both are included as individual studies under weight outcomes.

							informative materials and evaluating outcomes directly related to PA, four reported significant changes. Significant changes were reported in three of four trials offering facilities, time and space. One trial comparing both types of intervention found better results with educational activities focusing on behavioural changes, with 65% of at risk employees exercising weekly, compared with 50% when facilities only were offered. A motivationally tailored intervention appeared to be more effective in nearly all the stages of readiness. Information from the review on follow-up is limited. In a non-randomised controlled study reporting a 7-year follow-up, participation was still 13% – the same as at the end of the intervention period (Shephard 1992).	This review includes the Take Heart (Glasgow 1995) and Take Heart II (Glasgow 1997) studies. ***[?]***
Sorensen 1996	Cluster RCT	1	+	Worksites in manufacturing, communications, public service and utilities, USA Blue collar 51% Managerial 22%	**Aim:** To evaluate the effectiveness of the Working Well intervention on Cancer risk factors. Multi-level interventions at	Two-year intervention and 1-year follow-up.	Overall response to baseline survey 69%; 71% response to follow-up. Attrition not stated. Adjusted difference between intervention and control of % energy from fat consumption – 0.35 (SE 0.16)% ($p < 0.05$).	No allocation concealment. ITT analysis by worksite by only about 70% response at each site.

				Clerical 22.4 Multiple 4.5%* Two groups with 54 sites each (28,000 employees).	individual, community and organisational levels including activities, posters and brochures, self assessment and self-help materials, campaigns and contests, direct education and environmental changes.		Adjusted % increase in fruit and vegetable intake 5.6 (SE 1.3)% – consistently higher in intervention and negligible in control ($p < 0.001$). It appeared that longer, interactive intervention efforts (contests and classes) resulted in more positive outcomes than one-time activities (such as the kick-offs) or more passive efforts (use of printed materials).**	Not included in Roe 1997 or Janer 2002. Complicated statistical analysis. The **Working Well** Trial *Information from Abrams 1994. **Information from Patterson 1997.
Sorensen 2002	Cluster RCT	1	+	Fifteen manufacturing worksites (of 41 eligible) in north-east USA, all with probable use of chemical hazards. Baseline variations between groups. 65–71% blue collar (hourly paid) workers. 12.4–15.6% ≤30 years old. 23.5–18.6% 51–	**Aim:** To assess whether health promotion + occupational health and safety intervention vs. standard health promotion (see above) results in significant smoking cessation and increase in fruit and vegetable intake in workers in general and blue collar workers in particular.	Length of interventi on 2 years	80% response at baseline ($n = 9019$) and 65% response at completion ($n = 7327$). 5156 responded on both occasions and data presented on this group. No significant differences for mean changes in fruit and vegetable consumption in either group or between groups. No significant difference between men and women in intervention effect ($p = 0.31$) and no difference by job type (data not shown).	The **WellWorks 2** study. Good allocation concealment. Some baseline differences between groups and no ITT analysis. Intervention to address cancer risk rather than obesity prevention and issue under test in occupational health and safety involvement.

				60 years old. 57–66% men.				
Emmons 1999	Individual RCT	1	+	26 worksites in north-east USA of which 22 sites and 2291 workers were included in the final analysis. Circa 57% male, Mean age approx. 42 years, approx. 53% blue collar, approx. 93% white, approx. 83% completed high school.	**Aim:** To present the results regarding behaviour change found among completers of three health behaviour assessments as part of their worksite's participation in the Working Healthy project. A development from the Working Well Trial (see above) but with a focus on PA. Individually focussed activities and changes to catering and exercise environment vs. self-help.	Length of interventi on 2.5 years	63% of eligible workers completed baseline survey. 51% completed interim survey. 83% who completed interim also completed final survey. Employees in the cohort were more likely to be male, older, White, and have higher educational levels. Subjects in the intervention condition were significantly more likely to report engaging in physical exercise at the time of the interim assessment ($p < 0.0001$) and the final assessment ($p < 0.03$), reflecting a 30% increase in activity, compared with a 4.3% increase in control. The intervention group showed a marginal increase in fruit and vegetable consumption at the final survey, a 7% increase vs. a 7% reduction in controls ($p < 0.06$ in the univariate model).	The **Working Healthy Project**. No allocation concealment. 51% completion at interim and no ITT analysis. Included in Proper 2003 review.
Sorensen 1999	Cluster RCT	1	+	Twenty-two community health centres in north-east USA.	**Aim:** To evaluate the results of an intervention to	Length of interventi on 19.5 months.	Response rate 87% at baseline ($n = 1359$) and 76% at follow-up. 47% response to both.	**Treatwell 5-a-Day** study. No allocation

				n = 1588 84% female. Age range unknown. 59% white/other 23% Latino 18% non-Latino black 80% educated to at least high school. Skill, service, clerical 29.2% Paraprofessional/ technical 20.2% Professional 36.2% Manager 14.3%	increase fruit and vegetable consumption. Three groups: 1) control; 2) worksite intervention – information/education sessions and activities; 3) worksite + family – as 2) but involvement of workers' children to produce a cookbook. Plus environmental changes. 74% power at *p* = 0.05.		After controlling for baseline variations total fruit and vegetable intake increased by 19% in the worksite plus family, 7% in the worksite and 0% in the control (*p* = 0.05). This reflects a one half serving increase in the worksite plus family to control grou*p* (*p* = 0.018). No significant difference between worksite only intervention grou*p* and control (*p* = 0.47). Gender, education and occupation not significantly associated with level of change.	concealment. Self-administered well referenced questionnaire. Community health workers may be more motivated than general population. Only 47% response at follow up and no ITT.
Nichols 2000	Individual RCT	1	+/– (weak)	San Diego, CA, USA. Workers who did not engage in regular PA in two worksites. *n* = 82 Data from final sample (only): majority White women, mean age 42.0 ± 9.7 years.	**Aim:** To evaluate the effects of a 3-month work-site behavioural skills training course on the adoption and 6 month maintenance of PA in middle-aged adults. The intervention group met weekly at the worksite. They were encouraged to participate in a semi-supervised exercise	Three-month interval. Plus 6 month follow-up (9-months post).	78% recruitment (*n* = 64). 73% of these subjects completed the 12-week and 71% completed the 6-month follow-up. Energy expenditure increased for both groups but was marginally greater for the intervention grou*p* (*p* = 0.07). Both groups showed a large increase in moderate and vigorous PA with no significant differences between groups.	No allocation concealment or ITT and <80% follow-up. No baseline data, low power and potential contamination.

					programme at a fitness facility. Controls were given membership of the fitness facility but received no exercise or behavioural training.			
Sorensen 1998	Cluster RCT	1	+/– (weak)	Twenty-four predominantly manufacturing worksites in north-east USA, all using known or suspected carcinogens. *n* = 9648 No social data presented.	**Aim:** To assess effects of health promotion intervention on changes in dietary habits and smoking cessation. Integrated programme with three key elements: 1) joint worker/management planning and implementation; 2) work-site environmental changes and increased availability of healthy foods; 3) targeted health education programmes.	Length of interventi on 2 years.	61% response at baseline (5914/9648) and 62% at completion (5406/8667). 2658 responded on both occasions and data presented on this group. Significant differences between intervention and control worksites included reductions in the percentage of energy consumed as fat (2.3 vs. 1.5% and increases in servings of fruit and vegetables (10 vs. 4% increase). No difference in intervention effectiveness by job category for fruit and vegetables and dietary fat outcomes.	The **WellWorks** study. No allocation concealment. Well referenced self-administered semi-quantitative questionnaire. No baseline data though worksites paired according to characteristics before randomisation. Intervention to address cancer risk rather than obesity prevention. Only circa 50% follow-up and no ITT analysis.

Evidence of corroboration (external validity)
Evidence of salience – Is it appropriate for the UK?

First author	Study design	Research type	Research quality	Study population	Research question	Length of follow-up	Main results	Confounders/comments
Hanlon 1995; Hanlon 1994	Individual RCT	1	++	One workplace, Scotland – Engineering factory, as above.	As above.	As above.	As above.	As above.
Leslie 2002	Individual RCT	1	++	Single petrochemical worksite in Scotland, UK.	As above.	As above.	As above.	As above.
Rose 1983	Cluster RCT	1	+	UK factories	As above.	As above.	As above.	As above.
Cockcroft 1994	CCT	2	+	London teaching hospital.	As above.	As above.	As above.	As above. Very weak non-randomised study.
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Hanlon 1998	Observational data from RCT	3	++	One workplace, Scotland – Engineering factory, as above. Mean age 44 years. 89% male	Individual health check – see above.	12-month follow-up.	Subjects who considered themselves to be at risk were more likely to comply with advised behaviour changes. Those who returned for follow-up and had reported one or more of the desired behaviour changes were more likely to be married or cohabiting, none of the other sociodemographic variables was significantly associated with behavioural change.	Characteristics of those who responded to the **Healthcheck** (Hanlon 1995). Self-reported outcomes.

Kelly 1999 (as for Hanlon 1998, above)	Observational data from RCT	3	++	As above.	As above.	As above.	Health checks in this setting, which involved screening for coronary heart disease, did not generate threat for most of the participants. The typical response to the check was positive and one that seemed to prompt an intention to change behaviour in a beneficial way to the individual.	Observational data from the **Healthcheck** study (Hanlon 1995). Self-reported outcomes.
Fleming 1997	Cross-sectional survey	3	+	Employees in seven worksites in the industrial, educational and health sectors in Galway, Ireland. *n* = 2528 38% male 70% men and 77% women ≤30 years.	**Aim:** To obtain a profile of the dietary behaviours of workers and explore potential barriers to change.	N/A	**Response rate:** 69% industry, 91% health sector and 48% education. Men chiefly cited a lack of nutritional information as a barrier to change while women predominantly cited the preferences of family members. Finance was not a factor for any particular social group. Interest in dietary change was especially evident in men in their 30s.	Not UK but Ireland. Self-administered questionnaire. Methodology and analysis unclear.
Health Development Agency 2002	Case Studies	3	+	Sixteen case studies at NHS worksites in the UK implementing the Health at Work (HAW) scheme.	Single semi-structured interviews (60–90 min) with the implementers of HAW at each site.	–	What works? Summary: • An interdisciplinary approach with broad representation including health and safety and human resources; • Implementers from high grades and strategic positions; • Initiatives integrated into worksite objectives; • Staff involvement and realistic objectives; • Communication with all staff;	

							• Activities that go beyond the superficial and address root causes.	
Cockcroft 1995; Cockcroft 1994	Observational data from CCT	3	+	See above.	See above.	See above.	Belief in the effectiveness of lifestyle change in promoting health and anxiety about health can influence uptake of screening.	Very weak non-randomised study.

2. INCREASED WATER PROVISION

SUMMARY

No relevant studies found.

3. HEALTHIER FOOD PROVISION

SUMMARY

Evidence of efficacy for weight maintenance/reduction
Only one intervention, a controlled before and after study (Cook 2001) was found with a weight outcome. The intervention, which consisted of nutrition displays and a monthly 30-min workshop (6-month intervention and 12-month follow-up), found there was no significant self-reported difference in mean BMI or waist circumference.

Evidence of efficacy for diet outcomes
One systematic review (Seymour 2004) concluded that worksite intervention studies targeting healthier food provision by information strategies such as labelling and/or changes in food availability or cost can encourage healthier eating. Two additional RCTs (Beresford 2001; Steenhuis 2004) were included in, or published since, the review. The US study, with measures 3-, 8- and 12-months post-intervention, found an effect of 0.3 servings of fruit and vegetables per day ($p < 0.05$) (Beresford 2001). This intervention (Seattle 5 a Day) built on lessons learnt from the Working Well Trial (included in the Seymour review, 2004). The study in the Netherlands, which looked at combinations of educational and food supply programmes, found no significant effects on consumption data (Steenhuis 2004).

Evidence of corroboration
The only relevant UK study, a controlled before and after study of the Heartbeat Award Scheme (Holdsworth 2004), suggested that worksite interventions can bring about changes to catering provision that may impact on dietary intakes. This study, with measures taken 6 months before and 6 months after the intervention, found significantly more positive change solely in the intervention sites for increase in fruit consumption ($p = 0.029$), reduction in consumption of fried foods ($p = 0.044$) and sweet puddings ($p = 0.042$), and more change to using lower fat milks ($p = 0.037$).

The authors of a cross-sectional survey in England of Heart Beat Award managers and caterers, government and health professionals, recommended improved promotion of the schemes and better integration with other health programmes (The Research Partnership 2000. Additional data from a single set of case studies found that factors most likely to make a canteen-style five-a-day intervention work are commitment from the top, enthusiastic catering management, a strong occupational health lead, links to other on-site health initiatives, free or subsidised produce and heavy promotion and advertisement at point of purchase (Healthlinks 2003).

EVIDENCE TABLE 3: HEALTHIER FOOD PROVISION

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
Cook 2001	CBA	2	++	Two South Auckland manufacturing worksites. *n* = 347 at intervention and *n* = 262 in control Voluntary participation and study open to male hourly paid employees. 40% obese at baseline. Huge baseline variations in intervention vs. control sites. Age (mean ± SD) 35.0 ± 11.2 vs. 42.9 ± 11.7 years. European 25.7 vs. 39.7%; ≥ 4 years at	**Aim:** To evaluate effectiveness of health promotion programme targeting dietary behaviours and PA in male hourly-paid workers. Nutrition displays in the cafeteria and monthly 30-min workshop for 6 months. Delayed intervention in control worksite.	After 6-month intervention and at 12 months.	Recruitment 38% at intervention (*n* = 132) and 46% at control (*n* = 121). Follow-up = 94% at 6 months and 89% at 12 months. Statistically significant differences between the intervention and control groups, in mean fat score ($p = 0.0003$), increase in vegetable intake ($p = 0.007$) and PA ($p = 0.005$). There was no significant difference in mean BMI or waist circumference between the groups.	Self-reported nutrition and PA measures. Ethnic variations may limit generalisability to UK.

				high school 50 vs. 29.8%, etc.				
Evidence of efficacy (internal validity) for diet/physical activity outcomes								
Seymour 2004 .	Systematic review	2 (impossible to tell if any included studies were RCTs)	++ (for systematic review overall)	Ten workplace studies, six of which were considered to be a strong or very strong research design.	**Aim:** All articles that included a nutrition intervention with an environmental or policy component conducted in an English-speaking industrialised country.	Various	The authors concluded that of ten worksite intervention studies targeting healthier food provision, most showed statistically significant changes in improved sales of healthier foods. Successful interventions included information strategies (eg labelling) and/or changes in availability and price of healthier foods.	Included studies of 'strong/very strong' research design: Dubois 1996 Jeffery 1993 French 2001 Levin 1996 Schmitz 1986 Wilbur 1981 Some studies had an incentive element.
Steenhuis 2004	Cluster RCT	1	+/– (weak)	The Netherlands. Seventeen worksite cafeterias of large companies or government organizations with mainly white collar workers. *n* = 5425 62% male. Mean age 38 (range 18–64) years. 60% with a high level of education.	**Aim:** To describe a study of effectiveness of two environmental interventions alongside an educational programme in reducing fat intake and increasing fruit and vegetable intake. Four conditions tested: the educational programme; the food	One-month and 6-months post intervention.	30.1% response at baseline. 76.4% of the above group at 1-month post and 61.3% at 6-months post. For the whole study population, no significant effects on consumption data were found for any of the programmes.	No allocation concealment. <80% follow-up with no ITT and some baseline differences. Complex statistical analysis.

					supply programme plus educational; the labelling programme; plus educational and a control group.			
Beresford 2001	Cluster RCT	1	+	Seattle, OR, USA. Twenty-eight worksites with cafeterias. *n* = 2828. Mean age 41.8 years. 58% female. 32% college graduates and a further 23% with postgraduate education. >86% white.	**Aim:** To evaluate the effect of the Seattle 5 a Day worksite programme to increase fruit and vegetable consumption. In each intervention worksite an employee advisory board implemented changes in the cafeteria and targeted individual behaviour (posters, brochures, paycheck inserts, etc.) informed by the stages of change theoretical model.	3-, 8- and 12-months post intervention with cohort of baseline respondents. Two years with cross-sectional data.	Response rate at baseline = 80% on average. At 2-year follow-up response rate = 71% on average. Results from the food frequency questionnaire suggested a fruit and vegetable increase of 0.5 servings per day in the intervention vs. 0.2 in the control worksites, an intervention effect of 0.3 ($p < 0.05$). Other measures of fruit and vegetable consumption, including unobtrusive indicators, supported the effectiveness of the intervention.	**Seattle 5 a Day.** Building on the **Working Well** trial. No allocation concealment. <80% follow-up and no ITT analysis. RCT not included in Seymour 2004 so retained for information.
Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Holdsworth 2004	CBA	2	+	Six workplaces in Leicestershire, UK. (Four intervention,	**Aim:** To evaluate changes in employee eating habits following Heartbeat Award	Measures taken 6 months before and 6 months after	Response rate to post-intervention survey (structured food frequency questionnaire) was 73.2% of possible employees in intervention sites, and 62.6% of possible employees post-intervention.	**Heartbeat Award Scheme** **Excluded from efficacy due to study design.**

				n = 453 employees; two control *n* = 124 employees) Intervention groups: Female 70.5% Age 19–45 years 62.2% Control groups: Female 33.5% Age 19–45 years 63.6% 88.8% of intervention, and 78% of control group in top three social class groups. 92.9% of intervention and 90.3% of control were White.	scheme and to determine if this change was due to the intervention. Four intervention worksites had received Heartbeat Award, Minimum criteria for award was that at least one-third of the dishes on the menu were 'healthy choices'. Control sites had been unsuccessful in receiving award.	intervention.	Significantly more positive change solely in the intervention sites for increase in fruit consumption (p = 0.029), reduction in consumption of fried foods (p = 0.044) and sweet puddings (p = 0.042), and more change to using lower fat milks (p = 0.037). No comparative changes in control worksites.	Inappropriate control group thus treated as CBA but retained for information since based in the UK. Self-reported dietary change. Self-selection by more motivated individuals inevitable.
Evidence for implementation – will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Healthlinks 2003	Case studies	3	+	Twelve worksites in Merseyside, UK.	Review of worksites implementing the Take Five initiatives	Various.	The factors most likely to make a canteen style five-a-day intervention work are: • Commitment from the top;	Evaluation report of the **Take Five** initiative.

				Factories *n* = 4 Hospital trusts *n* = 2 Local government *n* = 3 Pharmaceutical *n* = 2 Supermarket *n* = 1	to increase fruit and vegetable intakes in canteens.		• Enthusiastic catering manager; • Strong occupational health lead; • Linked to some other health initiative on site (e.g. Health Focus Group); • Free or subsidised produce; • Heavily advertised and promoted at point of sale.	
The Research Partnership 2000	Cross-sectional survey	3	+	Mailed questionnaire to Heart Beat Award (HBA) scheme managers (*n* = 81), local and health professionals who may or may not be involved in HBA or similar schemes (135), HBA caterers (210), non-HBA caterers (75), local government professionals involved with Best Value (71), Local Agenda 21 (140) or Environmental Health Action Plans, LEHAP (99) in England. No socio-economic details.	**Aim:** To assess the status of the HBA scheme as it completes its tenth year, to assess its value as a public health tool and to consider its future development. Questionnaire survey carried out by consultants (The Research Partnership) on behalf of the Health Education Authority.	N/A	Response rate = 24% (811/3244), with a range from the different groups consulted of 3–38% response, higher amongst those directly involved with HBA schemes (e.g. HBA managers 35%, HBA caterers 38%). Of local authority consultees who had stopped using the scheme, the primary reasons were lack of resources, lack of interest and/or a perceived need for a more locally tailored scheme. The main barriers for those who had not started a scheme were lack of resources and perceived low priority or interest. The main benefits for the local population were thought by organisations/caterers running the scheme to be the increased availability of healthy food choices (97%/89%) and a raising of awareness of health issues (71%/80%). HBA managers saw insufficient national publicity as the	Mailed questionnaire responses only and low response rate. Findings also relevant to Community two review.

							main challenge faced by those running schemes, followed by the difficulty in recruiting caterers to apply and insufficient funding. HBA caterers felt that insufficient customer awareness was the main challenge (mentioned by 85% and 43% gave this the top ranking). The authors concluded that 'essential' recommendations were improved promotion and research into potential improvements (integration with other health programmes, multi-agency working, enhanced support and guidance to caterers), while 'desirable' recommendations were greater flexibility (perhaps via a graded scheme) and improved regional co-ordination.	

4. INCENTIVES – FINANCIAL, COMPETITION AND OTHER

SUMMARY

Evidence of efficacy for weight maintenance/reduction

Three US-based RCTs (Forster 1985]; Jeffery 1985; Jeffery 1993) suggested that payroll incentive schemes were either only effective in the short term (i.e. during period of intervention) or ineffective for weight control. Follow-up data suggested that where weight was lost this was regained during the period (of 6–12 months) after the intervention (Forster 1985). The schemes included weigh-in, health education/group sessions and the provision of self-motivating materials.

Evidence of efficacy for diet/physical activity

One controlled before and after study (French 2001) concluded that, when prices of low-fat snacks in 55 vending machines were reduced by 10, 25 and 50%, the total number of items sold increased by 9, 39 and 93% respectively. The effect on energy consumption was unknown.

Evidence of corroboration

No UK corroborative studies found.

EVIDENCE TABLE 4: INCENTIVES – FINANCIAL, COMPETITION AND OTHER

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
Forster 1985 [220]	RCT	1	+	University of Minnesota, USA employees. *n* = 131 82% women Faculty = 11.5% of group instruction/attendance optional group only. Administrative/technical = 35.7 % overall. Clerical = 57.5% overall. Health promotion practitioner.	**Aim:** To evaluate a weight control programme using financial incentives through payroll deductions; weight loss self-instruction manual and food records for monitoring eating behaviours and calorie intake; weigh ins and group educational sessions 2 × 2 factorial analysis of components.	6-month follow-up. (1-year follow-up in further study.*)	4% participation. Overall attrition 21.4%. Mean weight loss 12.2 lb (5.53 kg) (or 10 lb [4.54 kg] by ITT analysis) was highest in those using self-instruction and not receiving incentives for weight loss, but there was no statistically significant difference between groups. Weight loss was positively associated with attendance at weight ins and educational sessions. Men more likely to achieve goals than women ($p < 0.004$), although small number of men may confound this. (After 1 year, over both studies (Forster (1985) and Jeffery (1985))), 79% regained some weight and 33% regained at least as	Some baseline differences and no allocation concealment. *Forster 1988

							much as they lost. Percentage maintaining post-treatment weight was not statistically significant. Differences between occupational groups of % maintaining post-treatment weight were not statistically significant (p = 0.07).*	
Jeffery 1993	RCT	1	+	Minnesota, USA. *n* = 2041 Thirty-two worksites (68.8% private sector in treatment and 56.3% in control). 400–900 employees (55% female in treatment group and 52.9% in control). 41% managerial/professional 41% clerical/sales 18% blue collar Mean BMI for both men and women 10% above actuarial ideals. Professional Health	**Aim:** To evaluate the effectiveness of a work-site health promotion programme in reducing obesity and prevalence of cigarette smoking. Health education classes combined with a payroll-based incentive scheme. Four rounds of 11 bi-weekly sessions over 2 years.	Two years concurrent with intervention.	20% participation in weight control programme. 23% reenrolment. Ineffective for weight and BMI change over 2 years, and no significant differences between treatment and control (all p > 0.50). Average weight loss 4.8 lb [2.18 kg] in intervention group. 83% participants in weight control programme were female. 43% were professional, 45% were clerical and 13% were blue collar. Blue collar workers, men and those who were less overweight were less likely to join programme.	No allocation concealment and no ITT but high total response rate (93%). **Healthy Worker Project.**

				Educators.				
Jeffery 1985	RCT	1	+	University of Minnesota, USA employees. *n* = 36 (of 675 invited). Two groups. Female = 86% overall Mean age = 42 years 22% faculty 45% administrative/technical 33% clerical/ Intervention delivered by a Health Promotion practitioner.	**Aim:** Pilot study for above To evaluate the effectiveness of a self-motivation programme of biweekly payroll deductions on weight control. Treatment and delayed treatment. Intervention was a self-motivation programme with incentives through payroll deductions.	6-month intervention + 3-month extension. (1-year follow-up in further study, Forster et al 1998)	6% participation. Attrition 11% in control group. Effective for weight loss in the short term (mean 12.3 lb [5.58 kg]). Weight losses significantly related only to attendance at weigh-ins ($p < 0.001$). Those who re-enrolled for further 3 months were three times more likely to lose weight than those who stopped ($p < 0.005$). Weight regained within 1 year (see above*). There were no statistically significant differences between job categories and age in terms of weight lost. The authors concluded that without continued intervention, worksites do not appear to offer special advantages in aiding weight control (Forster et al. 1988)	Modest baseline differences, no allocation concealment and no ITT analysis. However 94% completed the programme and 88.4% completed more than half the weigh-ins. Generalisable to motivated workers only.
Evidence of efficacy (internal validity) for diet/physical activity outcomes								
French 2001 .	CBA	2	+	Twelve worksites and 12 schools in Minneapolis, USA.	**Aim:** The effects of pricing and promotional strategies on purchases of low-fat snacks from vending	Twelve-month intervention with pricing levels crossed in	When prices of low-fat snacks in 55 vending machines were reduced by 10, 25 and 50%, the total number of items sold increased by 9, 39 and 93% respectively. The effect on	

					machines.	a Latin square design.	energy consumption was unknown.	

Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Evidence for Implementation – Will it work in the UK?								
First author	**Study design**	**Research Type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**

5. INCREASED ACTIVE TRAVEL TO AND FROM WORK – INCLUDE PEDOMETERS

SUMMARY

Evidence of efficacy for weight management/reduction
No studies with weight outcomes found.

Evidence of efficacy for diet/physical activity outcomes
There is evidence from one low quality controlled randomised study carried out in the UK (Mutrie 2002) and one before and after study in Finland (Oja 1991) that workplace promotional strategies can increase the number of people travelling actively to work. The UK study (Mutrie 2002) found that the intervention group was almost twice as likely to increase walking to work as the control group at 6 months (125 min walking per week vs. 61 min in the controls at 6 months; odds ratio (OR) 1.93, 95% CI 1.06, 3.52). The intervention (provision of written interactive materials) was not successful at increasing cycling. Of those who received the intervention at baseline, 25% (95% CI 17, 32) had increased their active commuting stage of change to action of maintenance at 12 months.

Evidence of corroboration
One study carried out in the UK.

EVIDENCE TABLE 5: INCREASED ACTIVE TRAVEL TO AND FROM WORK – INCLUDE PEDOMETERS

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/CIs for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
No studies with weight outcomes found.								
Evidence of efficacy (internal validity) for physical activity outcomes								
Mutrie 2002	RCT	1	–	Glasgow University Hospital and Health Board. Three worksites. 64% women. Mean age 38 (range 19–69) years. 76% from socio-economic classes 1–2 (professional and managerial), and most of remainder (20%) in class 3.	**Aim:** To determine if a self-help intervention delivered via written interactive materials could increase active commuting behaviour (walking and cycling). Cognitive behavioural intervention for pre-contemplating workers thinking about, or doing, some regular walking or cycling to work. Receipt of a pack entitled **'Walk in to work out'**. Control group received pack 6 months after intervention group.	One year with 6-month analysis.	Recruitment = 295 assigned to intervention (*n* = 145) or control (*n* = 150). 100% response at baseline. 66% at 6 months and 56% at 12 months. The intervention group was almost twice as likely to increase walking to work as the control group at 6 months (125 min walking per week vs. 61 min in the controls at 6 months; OR 1.93 [95% CI 1.06–3.52]). The pack was not successful at increasing cycling. 25 (95% CI 17–32)% of those who received the intervention at baseline had increased their stage of active commuting stage of change to action of maintenance at 12	Good allocation concealment. No ITT, <80% follow-up and no baseline data.

							months. There were no effects noted from the intervention for gender or age.	
Oja 1991	Before and after	2	+	Paper manufacturing company, Finland. Three sites. *n* = 1200	**Aim:** To evaluate a work–commuting exercise promotion programme. Promotion of active commuting to work through posters, newsletters, etc., with emphasis on safe routes. Improvement of traffic conditions.	6 months	7% of respondents to post-programme questionnaire reported increasing work commuting exercise, particularly among older workers. 20% reported increase in leisure time exercise. No significance stated.	Grading to be confirmed. Methods paper available in Finnish only – to be translated if higher quality studies not obtained from review of wider community interventions.

Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study Population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Mutrie 2002	RCT	1	+	Glasgow University Hospital and Health Board.	As above.	As above.	As above.	As above.
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Mutrie 2002	Qualitative data from a	3	++	As above	Five focus groups to look at barriers	6 months	Walkers overcame barriers more than cyclists. Barriers to	

	CCT			*n* = 27 (from 295)	to intervention: Maintenance walkers *n* = 3 men, *n* = 7 women Relapse walkers *n* = 6 women Maintenance cyclists *n* = 1 woman, *n* = 3 men Relapse cyclists *n* = 2 men Total relapse *n* = 2 men, *n* = 5 women		cycling were environmental: pollution, disrepair of cycle paths, lack of covered bike storage and safety. Suggestions for improvements that could be made by management included incentives for active commuting, reminders, encouragement of partial active commuting, safe covered cycle storage and on site showers and changing facilities.	

6. PHYSICAL ACTIVITY PROGRAMMES

SUMMARY

Evidence of efficacy for weight management/reduction

There is inconclusive evidence for the effect of physical activity interventions on body weight, BMI and body fat.

Of four RCTs only one (Pritchard 1997) found a significant effect on body weight between intervention and control groups (Pritchard 1997) with one RCT noting a significant before and after difference in the exercise group (2 kg, $p < 0.025$) with no significant difference in the control group (+0.7 kg; Grandjean 1996). Interventions focused on specific exercise sessions, about three times per week, all aerobics, with exception of Grandjean (1996) who encouraged walking, cycling and jogging. Trials were all very small and generally not of high quality. In addition, the amounts of exercise prescribed did not meet the levels recommended in the Chief Medical Officer's report *At Least Five a Week* (London: Department of Health, April 2004, http://www.dh.gov.uk/assetRoot/04/08/09/81/04080981.pdf).

Evidence of efficacy for physical activity outcomes

Results from a systematic review (Proper 2003) support the implementation of worksite PA programmes.

The overall conclusion of the review, based on five RCTs (two of high quality) and three non-randomised controlled trials was that there was strong evidence for a positive effect of PA programmes on PA. One study designated by the reviewers as a high quality RCT, the Working Healthy project (Emmons 1999), evaluated the effect of the programme at both the midpoint (1.25 years) and the endpoint (2.5 years). It was found that participants had significantly increased their self-reported participation in regular exercise by 10.4 (interim) and 11.9% (end) vs. 2.4 and 1.7% for the reference condition. The other study considered as a high quality RCT (Pritchard 1997) showed a greater increase of energy expenditure in the intervention group compared with the reference and diet group after 12 months(+14.6 vs. 6.5%).

Evidence of corroboration

No UK evidence of corroboration.

EVIDENCE TABLE 7: INCREASED ACTIVE TRAVEL TO AND FROM WORK – INCLUDE PEDOMETERS

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/CIs for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
Pritchard 1997	RCT	1	+	Business corporation. Overweight men. *n* = 66 Australia.	**Aim:** To compare total and regional body composition after subjects lost weight through change in diet or exercise. 30 minute aerobic exercise programme (minimum 3 × per week, at 65–75% of maximum heart rate), diet programme (reduced fat) or no intervention control. Bi-monthly meetings for all subjects and monthly counselling for intervention.	12 months	Fifty-eight included in analysis. Change in weight and BMI were significantly different in subjects in the intervention groups compared with control ($p < 0.05$). Change in weight –3.0% in exercise groups and –7.2% in diet group vs. +1.0% in control group. BMI –4.4% in exercise group and 8.2% in diet group vs. +1.0% in control.	No allocation concealment, no ITT but 88% follow-up.
Grønnings äter 1992	RCT	1	+	Insurance workers. Physically inactive.	**Aim:** To study the effects of two types of stress-reduction interventions on physically inactive	10 weeks and 6 months	*n* = 79 randomised into groups. Seventy-six included in 10-week analysis, of which 48.7% were women.	No allocation concealment, no ITT *but* 91% follow-up. No specific body

				n = 193 Oslo, Norway. Age range 25–67 years All administrative levels of employees represented.	employees. Aerobic exercise (55 min sessions 3 days per week for 10 weeks, at 70–80% of maximum heart rate) vs. stress management vs. no intervention control.		Seventy-two included at 6-month follow-up. Average attendance 80% women and 76% men in aerobic physical exercise group. No effect on body weight. No significance stated.	weight data given.
Grandjean 1996	RCT	1	+	Westinghouse Corporation, Texas, USA. Thirty-seven female blue collar workers.	Walking, jogging and cycling three times per week for 20–60 min vs. control (no intervention).	24-week intervention. No follow-up.	100% follow-up. Significant effect on body weight (2 kg weight loss, $p < 0.025$) between before and after measures in exercise group. No change in control group (+0.7 kg) but non-significant difference between groups. Difference in % fat between control and exercise groups approached but did not reach statistical significance ($p < 0.056$).	No allocation concealment. 100% follow-up.
Lee 1997	RCT	1	+	Thirty-seven female University workers aged 40–61 (mean 48.4). 76% secretarial/administrative.	Self-administered programme of low-impact aerobic exercise and education vs. control (wait list group invited to attend second 12-week programme). No power calculation.	12-week intervention. 24- and 48-week follow-up.	35/37 included in the analysis. No significant effect on body fat or BMI at 24 weeks compared with earlier measures. BMI was significantly higher in the exercise group at 48 weeks than 0,12 and 24 weeks; insufficient control group data at 48 weeks were available for analysis.	No allocation concealment. No ITT analysis but 94% follow-up.

Cook 2001	CBA	2	++	Two South Auckland manufacturing worksites. *n* = 347 at intervention and *n* = 262 in control. Voluntary participation and study open to male hourly paid employees. 40% obese at baseline. Huge baseline variations in intervention vs. control sites. Age (mean ± SD) 35.0 ± 11.2 vs. 42.9 ± 11.7 years . European 25.7 vs. 39.7%. ≥4 years at high school 50 vs. 29.8%, etc.	**Aim:** To evaluate effectiveness of health promotion programme targeting dietary behaviours and PA in male hourly-paid workers. Nutrition displays in the cafeteria and monthly 30-min workshop for 6 months. Delayed intervention in control worksite.	After 6 month interventio n and at 12 months.	Recruitment 38% at intervention (*n* = 132) and 46% at control (*n* = 121). Follow up = 94% at 6 months and 89% at 12 months. Statistically significant differences between the intervention and control groups, in mean fat score ($p = 0.0003$), increase in vegetable intake ($p = 0.007$) and PA ($p = 0.005$). There was no significant difference in mean BMI or waist circumference between the groups.	Self-reported nutrition and PA measures. Ethnic variations may limit generalisability to UK.
Evidence of efficacy (internal validity) for physical activity outcomes								
Proper 2003	Systematic review	1	++	Literature search of English language papers	**Aim of review:** To review the effectiveness of	Various.	The overall conclusion from five RCTs (two of high quality) and three non-randomised controlled	The two trials designated as sound RCTs

				from 1980 to 2000. Twenty-six randomised or non-randomised studies including 15 RCTs and 11 non-RCTs in all. The review included five RCTs (two of high quality) and three non-randomised trials with PA outcomes.	worksite PA programmes on PA, physical fitness and health.		trials was that there was strong evidence for a positive effect of PA programs on PA. The first high quality RCT, the Working Healthy project (Emmons 1999), evaluated the effect of the programme at both the midpoint (1.25 years) and the endpoint (2.5 years). It was found that participants had significantly increased their self reported participation in regular exercise by 10.4% (interim) and 11.9% (end) vs. 2.4% and 1.7% for the reference condition. The other high quality RCT (Pritchard 1997, see above) showed a greater increase of energy expenditure in the intervention group compared with the reference and diet group after 12 months(+14.6 vs. 6.5%).	were: Pritchard 1997 ; Emmons 1999 . Both of which would be designated as CCTs if appraised by NICE/HDA methodology.
Cook 2001 As above.	CBA	2	++	As above.	As above.	After 6-months interventio n and at 12 months.	Statistically significant differences between the intervention and control groups, in mean fat score (p = 0.0003), increase in vegetable intake (p = 0.007) and PA (p = 0.005).	Self-reported nutrition and PA measures. Ethnic variations may limit generalisability to UK.

Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								
First author	**Study**	**Researc**	**Researc**	**Study**	**Research**	**Length of**	**Main results**	**Confounders/co**

	design	h type	h quality	population	question	follow-up		mments
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Researc h type**	**Researc h quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/co mments**

7. INCREASED OCCUPATIONAL HEALTH PROVISION AND/OR REFERRAL TO PRIMARY CARE

SUMMARY

No relevant studies found.

8. INCREASED USE OF STAIRS

SUMMARY

Evidence of efficacy for weight management/reduction
No studies found.

Evidence of efficacy for physical activity outcomes
From one interrupted time series study, there is evidence that environmental improvements may increase stair use. Effective actions included re-decoration, motivational signs and music in the stairwell (Kerr 2004). Another interrupted time series study found that posters alone were not effective (Kerr 2001) but a before and after study (Vanden Auweele 2005) that included an email reminder found a temporary improvement while the sign was in place.

Evidence of corroboration
One UK study suggested that posters alone may cause feelings of ‘laziness’ and ‘guilt’ (Kerr 2001).

Cost-effectiveness data
No cost-effectiveness studies found.

EVIDENCE TABLE 8: INCREASED ACTIVE TRAVEL TO AND FROM WORK – INCLUDE PEDOMETERS

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity) for weight maintenance/reduction								
No studies with weight outcomes.								
Evidence of efficacy (internal validity) for physical activity outcomes								
Kerr 2004	Interrupted time series	2	++	Single five-storey site (Centers for Disease Control and Prevention [CDC]) in Georgia, USA. 74.2% female. Age ≥18 years. 66.4% white, 28.2% African American. 554 permanent employees and 110 temporary.	**Aim:** To assess the impact of stair use of four sequential environmental changes to the stairwell. 1) New carpeting and paint October 1998; 2) Artwork December 1998; 3) Motivational signs September 1999 4) Music in stairwell October 2001.	3.5 years in all.	Both motivational signs and music significantly increased stair use by 8.9% over baseline ($p < 0.05$).	Other factors may have influenced stair use during the study period. The workforce may have been more motivated given their work in a health promotion area.
Kerr 2001	Interrupted time series	2	++	Two accountancy firms (one nine-storey and one four-storey) in the	A1-sized poster reading 'Stay healthy, use the stairs'.	Two-week baseline plus 2-week	There was no significant effect of the poster on stair use in either site. Site one: OR 1.04 (95% CI 0.92, 1.18). Site two: OR 1.22	Very short-term study. The authors

				midlands, UK.		interventio n (4-week in second firm). Questionn aire after further week.	(95% CI 0.96, 1.55). The message, however, made 62% and 47% of respondents respectively feel guilty or lazy.	speculated that the feelings of laziness and guilt may have caused workers to reject the message.
Vanden Auweele 2005	Before and after	2	+	131 women in an almost entirely female (131/135) workplace (a socio-cultural organisation) in Belgium. No socio-economic details provided.	**Aim:** To evaluate the impact of two simple interventions aimed at promoting stair use among female employees at a five-floor worksite. After a baseline week an intervention in the first week involved a health sign placed at the junction between the staircase and the elevator. In the second week an email was sent by the worksite's doctor, pointing out the benefits of stair use. The sign was removed 4 days after the observations in the second week. Follow-up data were collected 4 weeks after the second	One-week baseline collection plus one week with sign, plus one further week following email. Follow-up 4 weeks after second interventio n week.	In total, 3146 observations were made. Stair use increased significantly from 69% at baseline to 77% during the week after the first intervention ($p < 0.001$). Compared with the first intervention, stair use increased significantly to 85% in the week after the second intervention ($p < 0.001$). However, stair use decreased to 67% at follow up 1 month after the sign was removed and was not significantly different to baseline ($p = 0.52$).	Short term before and after study only. Reliable data collection (observation) but observers were visible.

					intervention week (i.e. 6 weeks post baseline). No power calculation. Higher education intervention. Observers were sport-management students.			

Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study Population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Kerr 2001	Interrupted time series	2	++	Two accountancy firms (one nine-storey and one four-storey) in the midlands, UK.	A1-sized poster reading 'Stay healthy, use the stairs'.	Two-week baseline plus 2-week intervention (4-week in second firm) Questionnaire after further week.	There was no significant effect of the poster on stair use in either site. Site one: OR 1.04 (95% CI 0.92, 1.18). Site two: OR 1.22 (95% CI 0.96, 1.55). The message, however, made 62% and 47% of respondents respectively feel guilty or lazy.	Very short-term study. The authors speculated that the feelings of laziness and guilt may have caused workers to reject the message.

9. STRATEGIES TO INFLUENCE WORKPLACES TO INVEST IN THE HEALTH AND ACTIVITY OF THEIR WORKFORCE (INCLUDES EFFECTS ON EMPLOYEE SICK LEAVE)

SUMMARY

Evidence of efficacy

The evidence base for strategies to influence workplaces is weak. Although there are some indications that sick leave is reduced in workers who have received worksite PA interventions the body of evidence is inconclusive. An RCT found no statistically significant difference although a trend to reduced sick leave was evident (Nurminen 2002). A controlled before and after study (Kerr 1993) found a decrease of sick leave in intervention groups and an increase in controls (p = 0.04)

Evidence of corroboration

No evidence for UK corroboration found.

EVIDENCE TABLE 9: STRATEGIES TO INFLUENCE WORKPLACES TO INVEST IN THE HEALTH AND ACTIVITY OF THEIR WORKFORCE (INCLUDES EFFECTS ON EMPLOYEE SICK LEAVE)

The studies included below do not relate to weight, PA or diet outcomes. There is no evidence for efficacy in relation to either of these.

First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question** (include power calculation if available)	**Length of follow-up**	**Main results** (include effect size(s)/confidence intervals for each outcome if available)	**Confounders** (potential sources of bias)**/comments**
Evidence of efficacy (internal validity)								
Nurminen 2002	Individual RCT	1	++	Female laundry workers. Finland. *n* = 260 Intervention = 133 Control = 127 Mean age = 40 years 23% intermediate or secondary education. 12% vocational college or university education.	**Aim:** To evaluate the effect of worksite exercise intervention on perceived work ability and sick leave. Both groups had 30 min feedback from physiotherapist with individual exercise prescription and counselling. Intervention grou*p* also had physiotherapist-led exercise training for 1 hour, once per week for 8 months.	3-, 8-, 12- and 15-month follow-up.	Follow-up attendance 90% at 15 months. Approx. 50% of intervention group attended at least two-thirds of exercise sessions. No statistically significant differences in sick leave. Cumulative sick leave in hours at 8, 12 and 15 months was: Intervention: 87, 108 and 154 respectively Control: 82, 96 and 132 respectively	As sick leave information was from Personnel records, no diagnoses of sickness available.
Kerr 1993	CBA	2	++	Bank Headquarters. White collar	**Aim:** To evaluate the effectiveness of an employee fitness	1 year	Statistically significant differences were found between the intervention and control groups on mean total absence.	

				workers. *n* = 152 Amsterdam	programme (EFP) on possible changes in absenteeism, general well-being, self-confidence and perceived physical condition. Four groups. Interventions: 1) Participant in EFP and regular attendance; 2) Participant in EFP and irregular attendance. Controls: 3) Non-participant in EFP and regular exerciser; 4) Non-participant in EFP and non-exerciser.		41.1 and 28.4% decreases in intervention groups and 11.4 and 48.1% increases in control (p = 0.01). Statistically significant differences between mean total absence frequency between groups. Decrease in intervention groups and increase in controls (p = 0.04).	

Evidence of corroboration (external validity)								
Evidence of salience – Is it appropriate for the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**
Evidence for implementation – Will it work in the UK?								
First author	**Study design**	**Research type**	**Research quality**	**Study population**	**Research question**	**Length of follow-up**	**Main results**	**Confounders/comments**

SEARCH STRATEGIES

1. exp OBESITY/
2. exp Weight Gain/
3. exp Weight Loss/
4. obes$.ti,ab.
5. (weight gain or weight loss).ti,ab.
6. (overweight or over weight or overeat$ or over eat$).ti,ab.
7. weight change$.ti,ab.
8. ((bmi or body mass index) adj2 (gain or loss or change)).ti,ab.
9. body mass.ti,ab.
10. exp Diet, Fat-Restricted/
11. exp Diet, Reducing/
12. (fruit or vegetable$ or healthy eating or diet$).ti,ab.
13. (high fat$ or low fat$ or fatty food$).ti,ab.
14. exp EXERCISE/
15. (physical activity or physical inactivity or physical fitness).ti,ab.
16. or/1–15
17. exp Behavior Therapy/
18. exp Social Support/
19. exp Psychotherapy, Group/
20. ((psychological or behavio?r$) adj (therapy or modif$ or strateg$ or intervention$)).ti,ab.
21. (group therapy or cognitive therapy).ti,ab.
22. ((lifestyle or life style) adj (chang$ or intervention$)).ti,ab.
23. counsel?ing.ti,ab.
24. social support.ti,ab.
25. (peer adj2 support).ti,ab.
26. or/17–25
27. exp OBESITY/dh [Diet Therapy]
28. exp Diet, Fat-Restricted/
29. exp Diet, Reducing/
30. exp Diet Therapy/
31. exp FASTING/
32. diet$.ti,ab.
33. (diet$ adj (modif$ or therapy or intervention$ or strateg$)).ti,ab.
34. (low calorie or calorie control$ or healthy eating).ti,ab.
35. (fasting or modified fast$).ti,ab.
36. exp Dietary Fats/
37. (fruit or vegetable$).ti,ab.
38. (high fat$ or low fat$ or fatty food$).ti,ab.
39. formula diet$.ti,ab.
40. or/27–39
41. exp EXERCISE/
42. exp Exercise Therapy/
43. exercis$.ti,ab.
44. (aerobics or physical therapy or physical activity or physical inactivity).ti,ab.
45. (fitness adj (class$ or regime$ or program$)).ti,ab.
46. (aerobics or physical therapy or physical training or physical education).ti,ab.
47. dance therapy.ti,ab.
48. sedentary behavio?r.ti,ab.
49. or/41–48
50. exp Complementary Therapies/
51. (alternative medicine or complementary therap$ or complementary medicine).ti,ab.
52. (hypnotism or hypnosis or hypnotherapy).ti,ab.
53. (acupuncture or homeopathy or homoeopathy).ti,ab.
54. (chinese medicine or indian medicine or herbal medicine or ayurvedic).ti,ab.
55. or/50–54
56. ((diet or dieting or slim$) adj (club$ or organi?ation)).ti,ab.
57. (weightwatcher$ or weight watcher$).ti,ab.

58. (correspondence adj (course$ or program$)).ti,ab.
59. (fat camp$ or diet$ camp$).ti,ab.
60. or/56–59
61. exp Health Promotion/
62. exp Health Education/
63. (health promotion or health education).ti,ab.
64. media intervention$.ti,ab.
65. or/61–64
66. exp Health Policy/
67. exp Nutrition Policy/
68. (health polic$ or food polic$ or nutrition polic$).ti,ab.
69. or/66–68
70. exp OBESITY/pc [Prevention & Control]
71. exp Primary Prevention/
72. (primary prevention or secondary prevention).ti,ab.
73. (preventive measure$ or preventative measure$).ti,ab.
74. (preventive care or preventative care).ti,ab.
75. (obesity adj2 (prevent$ or treat$)).ti,ab.
76. or/70–75
77. exp Controlled Clinical Trials/
78. exp Random Allocation/
79. exp Double-Blind Method/
80. exp Single-Blind Method/
81. exp PLACEBOS/
82. exp Research Design/
83. exp Intervention studies/
84. exp Evaluation studies/
85. exp Cost Benefit Analysis/
86. (time adj series).tw.
87. ((singl$ or doubl$ or trebl$ or tripl$) adj5 (blind$ or mask)).ti,ab.
88. exact{CONTROLLED-CLINICAL-TRIAL}.pt.
89. placebo$.ti,ab.
90. (matched communities or matched populations).ti,ab.
91. (control$ adj (trial$ or stud$ or evaluation$ or experiment$)).ti,ab.
92. (comparison group$ or control group$).ti,ab.
93. matched pairs.ti,ab.
94. (outcome study or outcome studies).ti,ab.
95. (quasiexperimental or quasi experimental or pseudo experimental).ti,ab.
96. (nonrandomi?ed or non randomi?ed or pseudo randomi?ed).ti,ab.
97. randomi?ed.hw
98. (cohort or survey: or qualitative).ti,ab.
99. or/77–98
100. exp Meta-Analysis/
101. meta-analys$.ti,ab.
102. metaanalys$.ab,ti.
103. meta analys$.ab,ti.
104. Cochrane.ab,sh,ti.
105. (review$ or overview$).ti.
106. review$.pt.
107. (synthes$ adj3 (literature$ or research or studies or data)).ab,ti.
108. pooled analys$.ab,ti.
109. ((data adj2 pool$) and studies).mp. [mp = title, original title, abstract, name of substance, mesh subject heading]
110. ((hand or manual or database$ or computer$) adj2 search$).ab,ti.
111. ((electronic or bibliographic$) adj2 (database$ or data base$)).ab,ti.
112. ((review$ or overview$) adj10 (systematic$ or methodologic$ or quantitativ$ or research$ or literature$ or studies or trial$ or effective$)).ab.
113. or/100–112
114. (retrospective$ adj2 review$).ab,sh,ti.
115. (case$ adj2 review$).ab,sh,ti.

116. (record$ adj2 review$).ab,sh,ti.
117. (patient$ adj2 review$).ab,sh,ti.
118. (patient$ adj2 chart$).ab,sh,ti.
119. (peer adj2 review$).ab,sh,ti.
120. (chart$ adj2 review$).ab,sh,ti.
121. (case$ adj2 report$).ab,sh,ti.
122. (rat or rats or mouse or mice or hamster or hamsters or animal or animals or dog or dogs or cat or cats or bovine or sheep).ab,sh,ti.
123. or/114–122
124. 123 not (123 and 113)
125. 113 not 124
126. 26 or 40 or 49 or 55 or 60 or 65 or 69 or 76
127. 16 and 126 and 99
128. 16 and 126 and 125
129. 127 or 128
130. animal.sh.
131. human.sh.
132. 130 not (130 and 131)
133. 129 not 132
134. exp workplace/
135. exp working conditions/
136. exp occupations/
137. exp occupation/
138. exp business/
139. exp staff development/
140. exp employee incentive plans/
141. exp incentives/
142. exp management/
143. exp personnel management/
144. exp office management/
145. exp work/
146. exp occupational health/
147. exp occupational health services/
148. exp employer/
149. exp employer-employee relations/
150. exp employer health costs/
151. exp employee assistance programs/
152. exp named groups by occupation/
153. exp ‘occupational health and safety’/
154. employment$.ti,ab.
155. occupation$.ti,ab.
156. (worker$ or employe$ or staff$ or personnel$).ti,ab.
157. (employ$ adj2 (place$ or site$ or locat$ or set$ or environ$)).ti,ab.
158. (work$ adj2 (place$ or site$ or locat$ or set$ or environ$ or condition$)).ti,ab.
159. (work?place$ or work?site$ or work?locat$ or work?set$ or work?environ$).ti,ab.
160. (job$ adj2 (place$ or site$ or locat$ or set$ or environ$)).ti,ab.
161. (job?place$ or job?site$ or job?locat$ or job?set$ or job?environ$).ti,ab.
162. (corporat$ or business$ or public sector$ or private sector$).ti,ab.
163. office$.ti,ab.
164. vocation$.ti,ab.
165. trade$.ti,ab.
166. or/134–165
167. and/133,166
168. limit 167 to yr=1990–2004

DATA SOURCES

Database searches were carried out in October 2004 for papers published from 1990 onwards (1995 onwards for systematic review level evidence).

The following information sources were searched:

AMED (Allied and Complementary Medicine)
ASSIA (Applied Social Sciences Index and Abstracts)
British Nursing Index
CAB Abstracts - Human health and nutrition, agriculture
CENTRAL (Cochrane Controlled Trials Register)
CINAHL (Cumulative Index to Nursing & Allied Health Literature)
Clinical Evidence - http://www.clinicalevidence.org
Cochrane Database of Systematic Reviews
NHS EED (NHS Economic Evaluation Database) - http://www.york.ac.uk/inst/crd
DARE (Database of Abstracts of Reviews of Effects)
Embase
EPPI-Centre - http://eppi.ioe.ac.uk/
ERIC (Educational Resources Information Centre)
Food Standards Agency - http://www.food.gov.uk/science/research/
HDA Evidence Base - http://www.hda-online.org.uk/html/research/effectiveness.html
Health Evidence Bulletins – Wales - http://hebw.cf.ac.uk
HealthPromis
IUHPE (International Union for Health Promotion and Education) - http://www.iuhpe.nyu.edu/pubs/index.html
Medline
NCCHTA (National Coordinating Centre for Health Technology Assessment) - http://www.ncchta.org
NICE (National Institute for Clinical Excellence) – www.nice.org.uk
Public Health Effectiveness (Hamilton, Ontario) - http://www.health.hamilton-went.on.ca/CSCARB/EPHPP/ephpp.htm
PsycINFO
SIGN (Scottish Intercollegiate Guidelines Network) – http://www.sign.ac.uk
Social Science Citation Index (equiv. to Current Contents)
Sociological Abstracts
Sport Discus
Lisa Janzen (Canadian workplace health specialist) contacted.

Update searches
An update search of the same databases was carried out in September 2005 for worldwide intervention and UK corroborative studies. A final search was completed on 1 December 2005 for systematic reviews and controlled trials only in a reduced number of databases: CINAHL, Cochrane, Embase, Medline and PsycINFO.

The search strategies were developed in Medline and adapted for use with the other information sources.

EXCLUDED REFERENCE LIST

Excluded reference	Reason for exclusion
Abood DA, Black DR, Feral D. Nutrition education worksite intervention for university staff: Application of the health belief model. *Journal of Nutrition Education and Behavior* 2003;35(5):260–7.	8-week follow-up.
Addley K, McQuillan P, Ruddle M. Creating healthy workplaces in Northern Ireland: evaluation of a lifestyle and physical activity assessment program. *Occupational Medicine* 2001;51(7):439–449.	Better evidence available.
Aldana SG, Jacobson BH, Harris CJ, Kelley PL. Mobile work-site health promotion programs can reduce selected employee health risks. *Journal of Occupational and Environmental Medicine* 1993;35(9):922–8.	≤1996.
Aldana SG, Merrill RM, Price K, Hardy A, Hager R. Financial Impact of a comprehensive worksite health promotion program. *Preventive Medicine* 2005;40(2):131–137.	Economic analysis. Passed to York.
Alexy B. Workplace health promotion and the blue collar worker. *American Association of Occupational Health Nurses* 1990;38(1):12–6.	Paper not held at British Library. Unable to trace.
Ammerman AS, Lindquist CH, Lohr KN, Hersey J. The efficacy of behavioral interventions to modify dietary fat and fruit and vegetablesetable intake: a review of the evidence. *Preventive Medicine* 2002;35:25–41.	Excluded at Critical Appraisal. Serious concerns about conclusions due to diverse range of settings chosen. Also includes children/adolescents.
Anderson JV, Mavis BE, Robison JI, Stoffelmayr BE. A work-site weight management program to reinforce behavior. *Journal of Occupational and Environmental Medicine* 1993;35(8):800–4.	≤1996.
Anderson DR, Staufacker MJ. The impact of worksite-based health risk appraisal on health-related outcomes: a review of the literature. *American Journal of Health Promotion* 1996;10(6):499–508.	≤1996 and literature review only.
Anderson DR, Whitmer RW, Goetzel RZ et al. The relationship between modifiable health risks and group-level health care expenditures. *American Journal of Health Promotion* 2000;15(1):45–52 .	Discussion of risk factors in relation to healthcare expenditure only.
Angotti CM, Chan WT, Sample CJ, Levine MS. Combined dietary and exercise intervention for control of serum cholesterol in the workplace. *American Journal of Health Promotion* 2000;15(1):9–16.	Outcome was serum cholesterol only.
Aoun S, Johnson L. Diabetes education and screening in worksites in rural Western Australia. *Health Promotion Journal of Australia* 2002;13(1):65–8.	Diabetes awareness program in high risk individuals only.
Arao T, Suyama Y, Imaizurni T, Nagamatsu T. Adherence and effectiveness of worksite stair-climbing exercise program on health and physical fitness in white-collar workers. *Bulletin of the Physical Fitness Research Institute* 1997;94:10–23.	Paper not held at British Library. Unable to trace.
Atlantis E, Clow C-M, Kirby A, Fiatarone Singh M. An effective exercise-based intervention for improving mental health and quality of life measures:a randomized controlled trial. *Preventive Medicine* 2004;39:424–34.	Outcomes not relevant to review.
Baer JT. Improved plasma cholesterol levels in men after a nutrition education program at the worksite. *Journal of the American Dietetic Association* 1993;93(6):658–63.	≤1996.
Balfour D, Moody R, Wise A, Brown K. Food choice in response to computer-generated nutrition information provided about meal selections in workplace restaurants. *Journal of Human Nutrition and Dietetics* 1996;9(3):231–7.	≤1996.
Barnes JT. Weight status during and after a 12-week weight loss program	Paper not held at

at the worksite. *Research Quarterly for Exercise and Sport* 2004;75(1):A15–6.	British Library. Unable to trace.
Barratt A, Reznik R, Irwig L, Cuff A, Simpson JM, Oldenburg B, et al. Work-site cholesterol screening and dietary intervention: the Staff Healthy Heart Project. Steering Committee. *American Journal of Public Health* 1994;84(5):779–82.	≤1996.
Barrere CC. Hospital employee cholesterol screening: modification of dietary behavior. *AAOHN Journal* 1994;42(6):261–9.	≤1996.
Beresford SA, Shannon J, McLerran D, Thompson B. Seattle 5-a-Day Work-Site Project: process evaluation. *Health Education and Behavior* 2000;27(2):213–22.	Same trial as Addley (2001)
Bertera RL. Behavioral risk factor and illness day changes with workplace health promotion: Two-year results. *American Journal of Health Promotion* 1993;7(5):365–73.	≤1996.
Biener L, Glanz K, McLerran D, Sorensen G, Thompson B, Basen-Engquist K, et al. Impact of the Working Well Trial on the worksite smoking and nutrition environment. *Health Education and Behavior* 1999;26(4):478–94.	Non-UK corroboration– excluded due to lack of time.
Bishop H. Changes in serum cholesterol after dietary instruction at the workplace. *Journal of the Canadian Dietetic Association* 1990;51(4):491–2.	≤1996.
Blue CL. Adherence to worksite exercise programs:an integrative review of recent research. *AAOHN Journal* 1995;43(2):76–86.	≤1996.
Boudreau F, Godin G, Pineau R, Bradet R. Health risk appraisal in an occupational setting and its impact on exercise behavior. *Journal of Occupational and Environmental Medicine* 1995;37(9):1145–50.	≤1996.
Briley ME, Montgomery DH, Blewett J. Dietary intakes of police department employees in a wellness program. *Journal of the American Dietetic Association* 1990;90(1):65–8.	≤1996.
Briley ME, Montgomery.G.H., Blewett J. Worksite nutrition education can lower total cholesterol levels and promote weight loss among police department employees. *Journal of the American Dietetic Association* 1992;92(11):1382–4.	≤1996.
Brill PA, Kohl HW, Rogers T, Collingwood TR, Sterling CL, Blair SN. The relationship between sociodemographic characteristics and recruitment, retention, and health improvements in a worksite health promotion program. *American Journal of Health Promotion* 1991;5(3):215–21.	≤1996.
Brodie D, Dugdill L. Health promotion at work. *Journal of the Royal Society of Medicine* 1993;86(12):694–6.	≤1996.
Brug J, Steenhuis I, van AP, de VH. The impact of a computer-tailored nutrition intervention. *Preventive Medicine* 1996;25(3):236–42.	6-week study only.
Bruno R, Arnold C, Jacobson L, Winick M, Wynder E. Randomized controlled trials of a non-pharmacologic cholesterol reduction program at the worksite. *Preventive Medicine* 1983;12:523–32.	≤1996.
Bull SS, Gillette C, Glasgow RE, Estabrooks P. Work site health promotion research:To what extent can we generalize the results and what is needed to translate research to practice? *Health Education and Behavior* 2003;30(5):537–49.	Non-UK corroboration– excluded due to lack of time.
Byers T, Mullis R, Anderson J, Dusenbury L, Gorsky R, Kimber C, et al. The Costs and Effects of A Nutritional Education-Program Following Work-Site Cholesterol Screening. *American Journal of Public Health* 1995;85(5):650–5.	≤1996.
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Chan CB, Ryan DAJ, Tudor-Locke C. Health benefits of a pedometer-based activity intervention in sedentary workers. *Preventive Medicine* 2004;39:1215–22	No control group. Most subjects overweight.

Chang SF. Worksite health promotion – on the effects of an employee fitness program. *Journal of Nursing Research:*2003;11(3):227–30.	Taiwan 8-week follow-up.
Cockcroft A, Gooch C, Ellinghouse C, Johnston M, Michie S. Evaluation of a programme of health measurements and advice among hospital staff. *Occupational Medicine (Oxford)* 1994;44(2):70–6.	≤1996.
Cohen NL, Stoddard AM, Sarouhkhanians S, Sorensen G. Barriers toward fruit and vegetablesetable consumption in a multiethnic worksite population. *Journal of Nutrition Education* 1998;30(6):381–6.	Non-UK corroboration–excluded due to lack of time.
Connell CM, Sharpe PA, Gallant MP. Effect of Health Risk Appraisal on Health Outcomes in A University Worksite Health Promotion Trial. *Health Education Research* 1995;10(2):199–209.	≤1996.
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DiGiacomo Consulting Services. Overview of physical activity programs in the Canadian workplace. Ottawa: DiGiacomo Consulting Services (Ottawa);1993.	Not held at British Library. Unable to trace.
Dubois A, Strychar IM, Champagne F, Leblanc MP, Tremblay C. Report. The effect of a worksite cafeteria program on employees' dietary fat intakes. *Journal of the Canadian Dietetic Association* 1996;57(3):98–102.	≤1996.
Eddy JM, Eynon D, Nagy S, Paradossi PJ. Impact of a physical fitness program in a blue-collar workforce*. Health Values: Achieving High Level Wellness* 1990;14(6):14–23.	≤1996.
Edye BV, Mandryk JA, Frommer MS, Healey S, Ferguson DA. Evaluation of a worksite programme for the modification of cardiovascular risk factors. *Medical Journal of Australia* 1989;150:574–81.	≤1996. Physical fitness outcome.
Elbel R, Aldana S, Bloswick D, Lyon J, Elbel R. A pilot study evaluating a peer led and professional led physical activity intervention with blue-collar employees. *Work: Journal of Prevention, Assessment and Rehabilitation* 2003;21(3):199–210.	8-week follow-up.
Elberson KL, Daniels KK, Miller PM. Structured and nonstructured exercise in a corporate wellness program. A comparison of physiological outcomes. *Outcomes Management for Nursing Practice* 2001;5(2):82–6.	Excluded at Critical Appraisal. Poor quality CBA.
Erfurt JC. Improving participation in worksite wellness programs: Comparing health education classes, a menu approach, and follow-up counselling. *American Journal of Health Promotion* 1990;4(4):270–8.	≤1996.
Erfurt JC, Foote A, Heirich MA. The cost-effectiveness of work-site wellness programs for hypertension control, weight loss, and smoking cessation. *Journal of Occupational Medicine* 1991;33(9):962–70.	≤1996.
Erfurt JC, Foote A, Heirich MA. The Cost-Effectiveness of Worksite	≤1996.

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Merom D, Miller Y, Lymer S, Bauman A. Effect of Australia's Walk to Work day campaign on adults' activie commuting and physical activity behaviour. *American Journal of Health Promotion* 2005;19(3):159–62	No control group. 1 day study only.
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Okada K. Effects of long-term corporate fitness program on employees health. *Journal of Nutritional Science and Vitaminology* 1991;37:S131–8.	≤1996.
Oldenburg B, Owen N, Parle M, Gomel M. An economic evaluation of four work site based cardiovascular risk factor interventions. *Health Education Quarterly* 1995;22(1):9–19.	≤1996.
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Payne N, Jones F, Harris PR. The impact of job strain on the predictive validity of the theory of planned behaviour: an investigation of exercise and healthy eating. *British Journal of Health Psychology* 2005;10:115–31	Questionnare with about 1% response rate – can't generalise.
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Peersman G, Harden A, Oliver S, Oakley A. *Effectiveness reviews in health promotion*. London: EPPI-Centre; 1999.	Methodology study.
Pegus C. Effect of the Heart at Work program on awareness of risk factors, self-efficacy, and health behaviors. *Journal of Occupational and Environmental Medicine 2002*;44(3):228–36.	Better evidence available.
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Perovich SJ, Sandoval WM. Outcomes of a worksite cholesterol education program over a 5-year period. *Journal of the American Dietetic Association* 1995;(5):589–90.	≤1996.
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Peters KK. Worksite health promotion with campus maintenance workers. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 1997; 58(5-B)	Not held at British Library. Abstract only.
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Pilon BA, Renfroe D. Evaluation of an employee health risk appraisal program. *American Association of Occupational Health Nurses* 1990;38(5):230–5.	≤1996.
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Pohanka M, Fitzgerald S. Urban sprawl and you. How sprawl adversely affects worker health. *AAOHN Journal* 2004;52(6):242–246	Non-systematic literature review.
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	baseline data for outcomes.
Prochaska JO, Norcross JC, Fowler JL, Follick MJ, Abrams DB. Attendance and outcome in a work site weight control program – processes and stages of change as process and predictor variables. *Addictive Behaviors* 1992;17(1):35–45.	≤1996.
Pronk N. Worksite health promotion. Systematic reviews on obesity. *ACSM's Health and Fitness Journal* 2005;9(1):34–36	No study design. Discussion paper.
Pohjonen T, Ranta R. Effects of a worksite physical exercise intervention on physical fitness, perceived health status, and work ability among home care workers:five-year follow-up. *Preventive Medicine* 2001;32(6):465–75.	Better evidence available.
Ranieri AM. Promoting regular exercise in an electronic worksite intervention. *Dissertation Abstracts International: Section B: The Sciences and Engineering* 1999; 59(10-B)	Not held at British Library. Abstract only. Four week follow up only.
Research Group of Rome Project of Coronary Heart Disease Prevention. Eight-year follow-up results from the Rome Project of Coronary Heart Disease Prevention. *Preventive Medicine* 1986;15:176–91	Pre-1990 and more recent RCTs.
Rooney B, Smalley K, Larson J, Havens S. Is knowing enough? Increasing physical activity by wearing a pedometer. Wisconsin Medical Journal 2003;102(4):31–6.	8-week follow-up.
Rose G, Heller RF, Pedoe HT, Christie DGS. Heart disease prevention project. *British Medical Journal* 1980;280:747–51.	≤1996.
Ruskin H, Bronner S. Effects of eight years of physical activity on health and behavior of industrial workers. *Journal of the International Council for Health, Physical Education and Recreation, Sport and Dance* 1994;30(4):22–25.	Paper not held at British Library.
Ruskin H, Halfon ST, Rosenfeld O, Tenenbaum G. The effect of a daily exercise program of industrial employees on selected physical fitness components. In: Kaneko M, editor. *Fitness for the aged, disabled and industrial worker*. Champaign, IL: Human Kinetics;1990: 254–9.	Excluded at Critical Appraisal. Poor quality RCT.
Ruzansky AS, Dobson JD. Determining the use and perceived effectiveness of a point-of-purchase cafeteria nutrition education program. *Canadian Journal of Dietetic Practice and Research* 1998;59(2):90–2.	Non-UK corroboration–excluded due to lack of time.
Sasaki S, Ishikawa T, Yanagibori R, Amano K. Change and 1-year maintenance of nutrient and food group intakes at a 12-week worksite dietary intervention trial for men at high risk of coronary heart disease. *Journal of Nutritional Science and Vitaminology* 2000;46(1):15–22.	Outcomes examined for high-risk employees only.
Schafer E, Anderson P. Heart*style: a worksite nutrition education program in a rural setting. *Journal of Nutrition Education* 1998;(1):62–5.	Better evidence available.
Schmitz K, French SA, Jeffery RW. Correlates of changes in leisure time physical activity over 2 years: The healthy worker project. *Preventive Medicine* 1997;26(4):570–9.	Non-UK corroboration–excluded due to lack of time.
Sharpe PA, Connell CM. Exercise beliefs and behaviors among older employees – A health promotion trial. *Gerontologist* 1992;32(4):444–9.	≤1996.
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Shephard RJ. Do work-site exercise and health programs work? *Physician and Sports Medicine* 1999;27(2):48–50, 55–6, 59–62.	Review of reviews.
Shephard RJ. The benefits of exercise in school and the workplace: cost-effective options. In: Conference proceedings: Vol. 1 Physical Education. Wellington: New Zealand Association for Health, Physical Education and Recreation, 1990:177–94.	Paper not held at British Library. Unable to trace.
Shephard RJ. The costs and benefits of exercise: an industrial perspective. In: Kaneko M, editor. *Fitness for the aged, disabled, and*	≤1996.

industrial work. Champaign, IL: Human Kinetic Publishers; 1990:189–204.	
Shephard RJ. Worksite fitness and exercise programs: a review of methodology and health impact. *American Journal of Health Promotion* 1996;10(6):436–52.	≤1996.
Siggaard R, Raben A, Astrup A. Weight loss during 12 week's ad libitum carbohydrate-rich diet in overweight and normal-weight subjects at a Danish work site. *Obesity Research* 1996;4(4):347–56.	≤1996.
Simpson JM, Oldenburg B, Owen N, Harris D, Dobbins T, Salmon A et al. The Australian National Workplace Health Project: design and baseline findings. *Preventive Medicine* 2000;31(3):249–60.	Baseline evidence only – no published update found.
Simmons D, Fleming C, Cameron M, Leakehe L. A pilot diabetes awareness and exercise programme in a multiethnic workforce. *New Zealand Medical Journal* 1996;109(1031):373–6.	≤1996.
Smith S, Walbourn L, Snelling A. Investigating current trends in worksite weight management programs. *American Journal of Health Promotion* 2000;14(5):333.	Abstract only – not sufficient information.
Sorensen G. Promoting healthy eating patterns in the worksite: The Treatwell intervention model. *Health Education Research* 1991;5(4):505–55.	≤1996.
Sorensen G, Himmelstein JS, Hunt MK, Youngstrom R. A model for worksite cancer prevention: integration of health protection and health promotion in the Wellworks Project. *American Journal of Health Promotion* 1995;10(1):55–62.	≤1996.
Sorensen G, Hunt MK, Cohen N, Stoddard A, Stein E, Phillips J, et al. Worksite and family education for dietary change: the Treatwell 5-a-Day program. *Health Education Research* 1998;13(4):577–91.	Baseline data from Treatwell study. Study reported in Sorensen 1999.
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Sorensen G, Stoddard A, Ockene JK, Hunt MK, Youngstrom R. Worker Participation in an Integrated Health Promotion/Health Protection Program: Results from the WellWorks Project. *Health Education Quarterly* 1996;23(2):191–203.	≤1996.
Sproul AD, Canter DD, Schmidt JB. Does point-of-purchase nutrition labeling influence meal selections? A test in an Army cafeteria. *Military Medicine* 2003;168(7):556–60.	Better evidence available.
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