Proceedings of the Nutrition Society (2007), **66**, 25–32 DOI:10.1017/S0029665107005265

Nutrition interventions in women in low-income groups in the UK

Annie S. Anderson
Centre for Public Health Nutrition Research, Division of Medicine, Ninewells Medical School, University of Dundee, Dundee DD1 9SY, UK

In the UK the mental and physical health and well-being of millions of women are influenced by living in poverty. Low educational attainment, unemployment, low pay and poor areas of residence exacerbate the challenges of obtaining optimal food choices, dietary intake and healthy eating patterns. Poorer women are more likely to eat low amounts of fruits and vegetables, whole grains and fish, and higher amounts of sugar and sweetened drinks compared with more affluent women. Diet contributes to the health inequalities evident in high rates of diet-related morbidity (including obesity) and mortality (including IHD and stroke) and in maternal and child health considerations (including breast-feeding and family diet practices). There is a dearth of research on effective interventions undertaken with low-income women, reflecting some of the challenges of engaging and evaluating programmes with this 'hard to reach' subpopulation. Intervention programmes from the USA, including WISEWOMAN, the Women's Health Initiative, the American Special Supplemental Food Program for Women, Infants and Children and the Expanded Food and Nutrition Education Program provide models for changing behaviour amongst women in the UK, although overall effects of such programmes are fairly modest. Lack of evidence does not mean that that policy work should be not be undertaken, but it is essential that policy work should be evaluated for its ability to engage with target groups as well as for the behavioural change and health outcomes.

Women: Poverty: Diet: Food choice: Intervention

The aim of the present paper is to consider: (a) the context for nutrition interventions amongst women living in poverty (and some of the difficulties in undertaking trials in this population subgroup) in the UK; (b) the rationale for why nutrition interventions might be important; (c) intervention approaches in the UK and USA (and limitations of these approaches); (d) implications of the evidence base for policy and practice.

The context for nutrition interventions amongst women living in poverty

In 2003–4 twelve million individuals in Britain were living in poverty, of whom 3·5 million were children, approximately 2·5 million were adults living with those children, approximately 3·5 million were working-age adults living without any dependent children and two million were pensioners (Glennerster *et al*. 2004). In 2003–4 levels of poverty were defined as <60 % of the contemporary mean, e.g. the threshold for a two-adult household was £180/week (Palmer *et al*. 2005).

Within this very heterogeneous population group there will be specific subgroups such as women with disabilities, single mothers and women from ethnic minorities. Recent decreases in the number of individuals living in poverty have been helped by increasing rates of employment. However, being in employment does not mean being rescued from poverty. Approximately 3·7 million female and 1·8 million male employees aged ≥22 years were paid <£6·50/h in 2004 and approximately half these were part-time workers, mainly women. The number of working households who are in receipt of in-work benefits has more than trebled since 1996 (Palmer *et al*. 2005). Furthermore, one-third of women who find work do not have that work 6 months later. Over the last decade the employment rate among lone parents has risen from approximately 45 % to approximately 55 %. It is becoming increasingly clear that to make further decreases in the number of individuals living in

Corresponding author: Professor Annie S. Anderson, fax +44 1382 496452, email a.s.anderson@dundee.ac.uk

poverty in the UK that low pay (and other conditions at work) and higher out-of-work benefits will need to be seriously explored.

From a 'determinants of health' perspective (Dahlgren & Whitehead, 1991), living in low-income households will be relevant for every level of health influence, ranging from household to community to the wider environment. Living in conditions of relative poverty can exert a lifelong (and often intergenerational) effect on economic opportunities, life circumstances, individual health behaviours (such as smoking and dietary intake) and subsequent morbidity and mortality. Individuals from relative poverty have lower educational attainment. Unemployed individuals are more likely to be the victims of violent crime and lone parents are more than twice as likely as average to be burgled, and more likely not to have home insurance. Subsequently, fear of crime is also greater for individuals with lower incomes. Among those individuals aged >60 years, for example, 36% of women from low-income households report that they feel unsafe out at night (Palmer *et al*. 2005).

In terms of health, under-age pregnancy, low birth weight and infant death are classic indicators of poverty and health outcomes. However, there is a much wider range of lifestyle-related disorders that are more evident in poor women throughout the lifespan. Poorer women have worse levels of mental health and coping capacity to deal with life circumstances, without considering the efforts required to attain and consume a healthy balanced diet for themselves. Among the poorest 20% of the population, approximately 25% are judged to be at risk of developing mental health problems, just about twice the rate for individuals on average incomes.

The rationale for why nutrition interventions might be important

In the UK approximately one in five men and one in six women die from CHD (British Heart Foundation, 2006). In 2003 CHD caused approximately 114 000 deaths. The premature death rate from CHD for female manual workers was more than twice as high as that for female non-manual workers. South Asian women have a higher premature death from heart disease that is 51% greater than average (Petersen *et al*. 2005). Data from the Scottish Executive (Bromley *et al*. 2005*a*) show that both IHD and stroke are greater amongst women from poorer areas compared with those from more affluent backgrounds.

Poorer women are at higher risk of many chronic conditions, including incidence, mortality and survival for lung cancer. Lung cancer is the second most common cancer in women in Scotland and has a clear social-class gradient (McLaren & Bain, 1998). Historical patterns of smoking in Scotland account for current trends in the incidence of lung cancer, which is now falling in men but not in women. However, there are also other factors that may increase the risk of lung cancer, including diet.

Causes of morbidity such as obesity follow a similar pattern and are notably higher in women compared with men and highest in poorest areas; in Scotland almost one-third of all adult women have a BMI of $>30\,kg/m^2$ (Bromley *et al*. 2005*b*). Dental caries, constipation and a range of other gastrointestinal symptoms (Bytzer *et al*. 2001) related to diet and lifestyle are known to be more commonly reported amongst low-income households.

Thus, throughout adult life there are compelling reasons why dietary interventions might be targetted at low-income women to reduce total disease burden. In terms of nutrient intakes and food choices associated with the aetiology and progression of chronic diseases, the UK National Diet and Nutrition Survey (Hoare & Henderson, 2004) highlights several areas of concern. One of the main nutritional concerns is actually in relation to lower reported energy intake in poorer households despite higher levels of obesity. In part this finding reflects some of the difficulties of obtaining valid and reliable data from adults who may have competing time demands and worries, fragmented irregular lives and highly-dependent family and friends around them. The dilemma of trying to disentangle under-reporting and true dietary intake will hopefully be progressed by the results of the Food Standards Agency (2006) Low Income Diet and Nutrition Survey, which are eagerly awaited later this year.

Returning to the UK National Diet and Nutrition Survey data published in 2003–4, the nutrient intakes of women living in households 'in receipt of benefits' when compared with those of households not in receipt of benefits show lower daily intakes of energy, protein, fat, alcohol and fibre (NSP). In addition, vitamin A, riboflavin, folate, vitamin C, Fe and Ca (and most micronutrients estimated) are also lower. For several nutrients >10% of this vulnerable group fail to achieve the lower reference nutrient intake. In terms of food choices, women living in households in receipt of benefits are more likely to report consumption of table sugar, whole milk, burgers and kebabs, meat pies and pastries and are less likely to have consumed wholegrain and other high-fibre breakfast cereals, oily fish, fruit juice, fruit and vegetables and low-energy carbonated beverages than their more affluent counterparts. Most notable of all these foods choices is the social patterning of vegetables, fruits and fruit juices, which has been echoed in a range of surveys including the UK National Diet and Nutrition Survey and smaller-scale work in Scotland. For example, data for North Glasgow from the Multinational Monitoring of Trends and Determinants in Cardiovascular Disease Project (Wrieden *et al*. 2004) show time trends in fruit and vegetable consumption in women, with the least affluent consuming least and the gap in intakes between the most affluent and the least affluent increasing progressively.

Clearly, women's own health is of fundamental importance. Not all women go on to become mothers (or minders of children) and the postmenopausal period can last several decades. However, it is clear that the greatest emphasis on nutrition interventions should be directed at women's reproductive and nurturing roles. There are, of course, sound reasons for this approach both in terms of focusing on a very vulnerable period when nutrient demands are high (e.g. pregnancy) and utilising opportunities to

influence the health of the next generation (James *et al*. 1997). Additionally, women are often seen as key agents for dietary change and gatekeepers of family health, with responsibilities for organising, attaining, preparing and delivering domestic food for small armies of disagreeable, and often rebellious, children and adolescents.

In terms of nutritional interventions in women most attention has been devoted to maternal, child and family health rather than focusing on adult health in women themselves. Birth weight is frequently used as an indicator of individual and population health and is known to be strongly correlated with adult CVD. Data from the Millenium Cohort (Mayhew & Bradshaw, 2005) show, however, that whilst poverty increases the odds of low birth weight by 61 %, it is in fact the combined effects of unemployment, family type, educational level, young motherhood, being the firstborn and ethnicity that increase the odds of low birth weight. When all the factors are taken into account poverty no longer makes a separate contribution to low birth weight.

It is recognised that using the variable 'low income' in itself does not necessarily reflect the complex interaction of factors associated with living in poverty, including area effects. Indeed, it has become more common to use deprivation indices of areas of residence as a proxy for a range of relevant issues. For example, in terms of breast feeding in Scotland, current targets (Warren, 2005) are set at >50 % feeding at 6 weeks. Current rates for the population overall are 37·7 %, but only 7·2 % of mothers from the most deprived areas in the youngest age-group are still feeding at this important life stage (Bolling, 2006). Breastfeeding is associated with a reduced infection rate in early months, but also has longer-term health benefits, including a reduced risk of obesity in childhood and adolescence, and it is likely that this factor has a dose–response effect (Harder *et al*. 2005). Similar findings have been observed for age of introduction of complementary foods (Wilson *et al*. 1998). Work from the University of Dundee (Anderson *et al*. 2001; Alder *et al*. 2004) has reported the importance of the deprivation category of the area of mother's residence and the influence of maternal mother and peers, as well as being in receipt of free samples of solid foods, as factors that influence early weaning. Even within the preschool stage when infants have been fully weaned the socially-patterned food choices and dietary intakes shown in adult surveys clearly emerge. Whole grains, fruit, vegetables and fish are consumed less frequently (Gregory *et al*. 1995) and correspondingly higher levels of teeth decay by deprivation category are seen (Newton *et al*. 2005).

In summary, the woman as family's health gatekeeper must steer a course influenced by: life circumstances; available money; knowledge and skills about appropriate food choices; social pressure to conform to what friends, neighbours and family do and meet the culture norms of husbands and partners. In addition, actions will be influenced by neighbourhood effects of available stores, transport to larger supermarkets and the safety of their immediate area to support and facilitate physical activity and energy balance.

Intervention approaches in the UK and USA

To achieve reductions in chronic diet-related diseases the World Health Organization/Food and Agriculture Organization (2003) highlights the importance of both top–down (e.g. policy approaches) and bottom–up approaches, and local strategies and initiatives. Programmes and policy should be integrated and work hand-in-hand for maximum effect, employing a range of complementary actions (Stockley, 2001). Interventions to improve dietary changes can act by impacting on modifiable factors at an individual level, such as dietary knowledge, beliefs and attitudes and by improving psycho-social components (e.g. self efficacy). However, the long-term impacts of these dietary interventions will ultimately be enhanced and facilitated by societal interventions that tackle the context and situation of the living environment, and the balance between health promotion and food industry marketing. Dietary interventions cannot tackle the non-modifiable demographic characteristics such as socio-economic status of women, but available income will both influence and be influenced by dietary interventions.

Few interventions to reduce chronic diet-related diseases in low-income women in the UK have been systematically undertaken with dietary and health outcomes reported. Since low-income households tend to cluster geographically, a number of community-based programmes have been designed and implemented with the aim of reducing coronary risk factors. However, such programmes as 'Good Hearted Glasgow' (Hanlon, 1992), 'Have a Heart Paisley' (Blamey *et al*. 2005) 'Heart Beat Wales' (Tudor Smith *et al*. 1998) and 'Action Health' (Baxter *et al*. 1997) rarely report specific results for low-income women or have been inadequately powered to show subgroup analysis. In some cases the response rates for adults living in the most-deprived communities have been particularly low, and more recently gaining ethical approval has added to the evaluators' burden (Blamey *et al*. 2005). Such programmes have also raised a range of issues relating to the evaluation of community programmes, as illustrated by the Heart Beat Wales programme. This intervention used a coordinated range of activities, including public education campaigns along with supportive policy and infrastructure change. The resources that were developed included a BBC television series, food labelling and nutrition education with a major grocery retailer and Heart Beat restaurant awards. However, outcome measures (including the use of butter, fruit, vegetables, chicken, low-fat milk, wholemeal bread, smoking, frequency of exercise and body weight) in intervention and reference areas did not differ and it was concluded that these measures had been influenced by secular trends in lifestyle behaviours. Similarly, the analysis of results from independent samples in the USA (Minnesota and Pawtucket heart health programmes) has shown little difference in intervention effects between the test and control areas (Farquhar *et al*. 1990), which were 'modest in size and duration and generally within chance levels' (Luepker *et al*. 1994) and 'very limited' (Carleton *et al*. 1995). These findings raise a number of issues relating to evaluation.

https://doi.org/10.1017/S0029665107005265 Published online by Cambridge University Press

Smaller intervention programmes specifically targetted at low-income groups in the UK include the Food Standards Agency 'Cookwell' trial, the aim of which was to develop a transferable-food-skills initiative that would increase consumption of fibre-rich starchy carbohydrates, fish, vegetables and fruit, and decrease consumption of fat in adults (including men) living in areas of deprivation. The intervention consisted of a 10-week programme of cooking skills classes in eight communities across Scotland, using a community development approach and informed by formative research with the target group (Stead *et al*. 2004). The study had a quasi-experimental design with an intervention group and a delayed intervention group. The effectiveness of the project was evaluated quantitatively: pre- and post-intervention measures of budget, diet and body weight; a questionnaire-based cooking skills assessment. Qualitative research was also included in the study design (focus groups and interviews; Wrieden *et al*. 2007).

Of ninety-three participants, fifty completed food diaries at baseline and immediately post-intervention and forty of the fifty subjects completed a further 7 d food diary at 6 months post-intervention. There was an increase in fruit consumption in the intervention group (one extra portion of fruit per week) post-intervention, but this increase was not sustained after 6 months. Despite the small success in improving diet, the project coordinators also reported that the subjects' confidence in following a recipe and cooking from basic ingredients increased (Wrieden *et al*. 2007).

The limitations on the evaluation of community programmes add to the lack of evidence base to inform policy directives within the UK. A review published in the USA on cardiovascular health interventions in women (Krummel *et al*. 2001) suggests that 'cardiovascular health interventions geared toward women are scant and intervention research to improve women's cardiovascular health is sorely needed'. The same authors recommend that community-based dietary interventions might usefully:

> conduct qualitative research to determine the kinds of interventions women want;
> examine relapse prevention, motivation and maintenance of behaviour change;
> tailor programmes to the stage of the life cycle;
> tailor programmes to a woman's readiness to change;
> tailor programmes to subgroups, e.g. minority, low socio-economic and obese women;
> evaluate policy and environmental interventions.

Primarycare initiatives

Women have been the focus of primarycare interventions, including cardiovascular risk, obesity and general healthy eating. Many individuals of all ages come into contact with health professionals on a regular basis, particularly women, who are more likely to be responsible for family planning requirements and attend for cervical screening. A wide range of cardiovascular preventions studies has been undertaken in primary care, including the British Family Heart Study (1994), but again few of these studies report findings by gender and socio-economic group. The approaches used in primary care vary, but they include one-to-one nutrition counselling, behavioural counselling, self-help materials and computer-tailored messages.

The focus of dietary change has included cardiovascular risk factors, obesity and fruit and vegetables intake. The European Prospective Investigation into Cancer and Nutrition Study (Khaw *et al*. 2001) has demonstrated that small increases in fruit and vegetable intake are likely to make a difference in cardiovascular mortality. One of the most notable trials that focused on low-income subjects (Steptoe *et al*. 2003) has demonstrated that behavioural counselling could increase fruit and vegetable consumption more than nutritional counselling (by 1·5 servings/d *v*. 0·9 servings/d respectively at 12 months from a baseline of 3·60 servings/d *v*. 3·67 servings/d). The subjects included men and women aged 18–70 years (*n* 271) recruited from a primary health centre in a deprived ethnically-mixed inner-city area in the UK who were randomly assigned to either behavioural or nutrition counselling. The behavioural counselling was based on social-learning theory and the stages-of-change model. The interventions included two 15 min consultations 2 weeks apart that were tailored to the individual, with personalised specific advice and setting of long- and short-term goals. Recruitment of the target group was, however, challenging.

A US review (Whitlock & Williams, 2003) of evidence-based recommendations for physical activity promotion, dietary improvement and tobacco cessation from the US Preventive Services Task Force and the Task Force on Community Preventive Services (CTF) has found insufficient evidence in support of or against recommending behavioural counselling to promote a healthy diet in unselected patients in primarycare settings. The US Preventive Services Task Force recommends intensive behavioural dietary counselling (medium- to high-intensity counselling was defined as multiple contacts, generally more than six, lasting >30 min) by specialists (e.g. dietitians) for high-risk CVD patients, but found insufficient evidence to recommend routine healthy diet or physical activity promotion in primary care. At most, brief low- to medium-intensity (single or limited multiple contacts lasting <30 min) behavioural counselling in primary care can produce small to medium changes in self-reported dietary components. Whitlock & Williams (2003) also note that 'the evidence base for these recommendations generally applies to women. Better reporting of gender and minority subgroup outcomes will assist more in-depth understanding of potential differences in either the processes or outcomes of behavior change interventions'.

In the USA two trials specifically aimed at women's health have recently been undertaken. WISEWOMAN (see Centers for Disease Control and Prevention, 2006) is a Centers for Disease Control and Prevention-funded programme targetted at women aged 40–64 years from low-income backgrounds (e.g. those with little or no health insurance), in which they are given access to screening and lifestyle interventions aimed at disease prevention. The WISEWOMAN Program was established in 1993 through the expansion of services offered through the National Breast and Cervical Cancer Early Detection Program to include interventions for chronic disease risk factors. In

1995 the Centers for Disease Control and Prevention launched WISEWOMAN demonstration projects in three states, Massachusetts, North Carolina and Arizona (see Centers for Disease Control and Prevention, 2006). These projects offered lifestyle interventions designed to change risk factors for chronic diseases, especially physical inactivity and diet. Specific interventions included structured counselling, physical activity classes and walking groups. A major emphasis was placed on smoking cessation.

Between January 2000 and June 2005 more than 45 000 women were screened for risk factors for heart disease and stroke, and about 119 000 lifestyle intervention sessions were provided. The women who enrolled in the programme during this period were at high risk for heart disease and stroke; 74 % were overweight or obese, 27 % were smokers, 24 % had high blood pressure and 22 % had high cholesterol levels. Reports (Rosamond *et al*. 2000; Stoddard *et al*. 2004) suggest that the reduction in CVD risk among WISEWOMAN participants after 1 year ranged from 6 % in white women to 8·6 % in black women. A review of the lessons learned from the WISEWOMAN project undertaken in the three US States (Viadro *et al*. 2004) has concluded that 'WISEWOMAN projects faced challenges of integrating clinical and lifestyle interventions, reaching beyond a focus on individuals, marshaling substantial resources, and introducing complex interventions into stretched healthcare environments. The three Phase One projects were deemed successful in reaching underserved women, developing a more comprehensive women's health model, strengthening linkages to primary healthcare, experimenting with innovative behavioural interventions, and tapping into women's roles as social support providers and family/community gatekeepers'. The overall effects that have been reported to date when comparing the minimal-intervention and enhanced-intervention groups are, however, modest.

The Women's Health Initiative (see Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute, 2006) is the largest clinical investigation of strategies for the prevention and control of some of the most common causes of morbidity and mortality among postmenopausal women, including cancer, CVD and osteoporotic fractures. The Women's Health Initiative was initiated in 1992. Postmenopausal women aged 50–79 years were enrolled at one of forty Women's Health Initiative clinical centres across the USA into either a clinical trial (64 500 women) or an observational study (100 000 women). The clinical trial was designed to allow evaluation of three distinct interventions: a low-fat eating pattern (in which only 20 % energy were to be consumed from fat and fruit, vegetable and grain consumption was high), hormone-replacement therapy and Ca and vitamin D supplementation. The average follow-up for women in both the clinical trial and the observational study was approximately 8 years.

Participants had an average intake of 35 % energy from fat when the trial began in 1993, which decreased to an average intake of 24 % energy from fat by the end of the first year and by the end of the study the level had stabilised at 29 % energy from fat (Howard *et al*. 2006). Fruit and vegetable intake increased but not consumption of grains. At the end of the study the difference in fat intake between the low-fat-diet group and the usual-diet group was 8 % instead of the projected 11 %.

Early reports from the Women's Health Initiative for breast cancer (Prentice *et al*. 2006), colo-rectal cancer (Beresford *et al*. 2006) and CVD (Howard *et al*. 2006) show no reduction in disease by dietary intervention. However, in the subgroup analyses breast cancer rates were reduced by 22 % among women who started with the highest fat intake (>36·8 % energy from fat) and reduced their fat the most (to 23·6 % after 1 year; Stein, 2006). In addition, analysis by food records *v*. FFQ shows a positive association between fat and breast cancer risk (Freedman *et al*. 2006). For CVD there were small improvements in body weight, LDL cholesterol, diastolic blood pressure and Factor VIIC (Howard *et al*. 2006). Furthermore, HDL, triacylglycerols, glucose and insulin levels did not increase. Despite the lack of apparent effect on colo-rectal cancer, adenomas were reduced among the low-fat-diet group compared with the usual-diet group (Beresford *et al*. 2006). The analysis of results by income status has not yet been published.

Implications of evidence base for policy and practice

Interventions to address diet inequalities in women have tended to focus on the most vulnerable periods of the female life cycle, i.e. during pregnancy and lactation when there are specific opportunities within healthcare settings to provide educational and other interventions. The nutrient-dense diet recommended for optimal nutrition appears to provide a good opportunity for affecting lifetime health, but many women may be unable to attain this diet because it is not affordable or accessible. Acheson (1998) has recommended that 'further reductions in poverty in women of childbearing age, expectant mothers, young mothers, young children and older people should be made by increasing benefits in cash and kind to them'. However, dietary interventions aimed at increasing access, acceptability (within norms of current cultural eating habits) and awareness of appropriate food choices are also required.

In the UK there have been ranges of policy-driven initiatives directed at reducing health and nutrition inequalities in mothers and young children. These initiatives have included The Welfare Food System, now 'Starting Well', which has committed to 'using the resource more effectively to ensure children in poverty have access to a healthy diet and increased support for breast feeding and parenting' (Scientific Advisory Committee on Nutrition, 2002). In addition, a wide range of national schemes driven through local initiatives have operated in England (through activities within Sure Start, Health Action Zones, Healthy Living Centres and local action to deliver National Service Frameworks) and within Scotland (e.g. Health Improvement Plan, Scottish Community Diet Project) and Wales (Community Food Initiative). In addition, schemes such as the national School Fruit Scheme in England, breakfast clubs and school meal provision have supposedly contributed to improvements in

diet in children from socially disadvantaged areas. There are, however, three important issues to consider here. The first is that current policy work lacks robust evidence that such initiatives have changed dietary intakes and subsequent health. Second, an analysis of how successful such initiatives might be in an environment that promotes excess consumption has never been undertaken. Third, the target of dietary improvement has commonly been to improve the health of children, with women often acting as the conduit for children's health, rather than the woman's health.

In the UK there has been a long history of dietary interventions (mainly counselling) aimed at pregnant women, which indicates that nutrient intake can be improved during pregnancy, but there is no robust evidence that nutrition counselling impacts on rates of low birth weight, gestational age or length of birth. There have been very few evaluations undertaken on practical interventions aimed at improving access to healthy diets, improving food affordability and availability (e.g. practical food skills classes. One published study from University of Dundee (Wrieden & Symon, 2003) has evaluated the feasibility of a cooking skills programme led by midwives in a community setting for teenage pregnant women. The programme incorporated seven informal food preparation sessions and opportunities for discussion of food and health matters (including food safety and well-being in pregnancy). Whilst the midwives found the package easy to follow and use, only sixteen (of the 120 invited) women attended the course and the authors concluded that alternative methods of delivering and evaluating such a package should be investigated. Further cooking skills interventions are currently being funded by the Food Standards Agency, including studies of dietary interventions aimed at improving the diets of girls and women at risk of having low-birth-weight babies.

A major focus of health interventions has been to promote breast-feeding amongst low-income women. The merits of breast-feeding for the baby have been discussed, but it should be noted that lactation is also related to a reduced likelihood of maternal breast cancer. Considerable progress has been made in the arena of increasing breast-feeding but much more remains to be done. The conclusions of a recent Cochrane review (Dyson *et al*. 2006) reports that the forms of breast-feeding interventions (health education, breast-feeding promotion packs, early infant–mother bonding) evaluated for systematic review were effective at increasing breast-feeding initiation rates among women on low incomes in the USA. In the review seven trials involving 1388 women were included. Five trials involving 582 US women on low incomes show that breast-feeding education has a significant effect on increasing initiation rates compared with routine care (relative risk 1·53; 95% CI 1·25, 1·88).

The improvement of nutrition and health is a major aim of the American Special Supplemental Food Program for Women, Infants and Children (see US Department of Agriculture Food and Nutrition Service, 2006), which is directed at low-income nutritionally-at-risk pregnant women and preschool children. The scheme provides supplemental food, nutrition education and coordination of health care (Rush *et al*. 1988). The funds provided for the American Special Supplemental Food Program for Women, Infants and Children are divided between supplemental foods (75% of funds) and nutrition education (one-sixth of the administration funds), with food vouchers provided for Fe-fortified formula, cereal and (vitamin C-enriched) fruit juice for babies and infants and specific foods for children and pregnant and lactating women (e.g. milk, citrus juice). In addition, breast-feeding promotion and peer-counsellors have become an integral part of the programme. The impact of the programme has been demonstrated to increase maternal weight gain in pregnancy, increase intakes of energy and nutrient density, increase Hb and reduce anaemia, increase breast-feeding rates (Fairbank *et al*. 2000) and decrease childhood anaemia (Yip *et al*. 1987).

Another US programme that has demonstrated the achievement of changes in dietary awareness and empowering participants to change dietary practices (Chipman & Kendall, 1989) is the Expanded Food and Nutrition Education Program (see US Department of Agriculture, 2001). This programme is a federally-funded nutrition programme aimed at assisting low-income youth and families (with young children) and ethnic minorities to acquire practical food knowledge, skills, attitudes and behaviour change (including money management and getting the most from health assistance programmes) necessary to help achieve nutritionally-sound diets and the improvement of the total family diet and nutritional well-being. This programme is delivered through a series of lessons by paraprofessionals and volunteers adopting a hands-on, 'learn by doing' approach, often by individually-tailored home education sessions (Bowering *et al*. 1976). The programme has been shown to influence a range of food practices (including food budgeting, food safety and food preparation; Arnold & Sobal, 2000). Cost–benefit analysis suggests that for every US $1 invested in the programme, between US $2·48 (Tennessee) and US $10·64 (Virginia) in benefits from reduced healthcare costs can be expected (Rajopal *et al*. 2002).

Conclusion

In the UK the health and well-being of millions of women are influenced by living in poverty. Food choices, dietary intake and feeding behaviour are far from optimal amongst poorer women, and this situation is reflected in higher rates of diet-related morbidity and mortality well beyond maternal and child health considerations. Interventions to change diet need to take account of the factors that influence household economic status and should be integrated at policy, community and individual level.

There is a dearth of research on effective interventions in this subgroup of the population from within the UK, although there are some encouraging US examples to draw on in terms of possible intervention approaches.

Lack of evidence does not mean that that policy work should be delayed. It is recognised that engaging with 'hard to reach' groups of women is a challenge for intervention implementation and evaluation, and it is essential

https://doi.org/10.1017/S0029665107005265 Published online by Cambridge University Press

that policy work should be evaluated for its ability to engage with target groups as well as for behavioural change and health outcomes.

References

Acheson D (1998) *Independent Enquiry into Inequalities in Health*. London: The Stationery Office.

Alder EM, Williams FL, Anderson AS, Forsyth S, Florey CduV & Van der Velde P (2004) What influences the timing of the introduction of solid food to infants? *British Journal of Nutrition* **92**, 527–531.

Anderson AS, Guthrie CA, Alder B, Forsyth S, Howie PW & Williams FL (2001) Rattling the plate – reasons and rationales for early weaning. *Health Education Research* **16**, 471–479.

Arnold CG & Sobal J (2000) Food practices and nutrition knowledge after graduation from the Expanded Food and Nutrition Education Program (EFNEP). *Journal of Nutrition Education* **32**, 130–139.

Baxter T, Milner P, Wilson K, Leaf M, Nicholl J, Freeman J & Cooper N (1997) A cost effective, community based heart health promotion project in England: prospective comparative study. *British Medical Journal* **315**, 582–585.

Beresford SA, Johnson KC, Ritenbaugh C, Lasser NL, Snetselaar LG, Black HR *et al.* (2006) Low-fat dietary pattern and risk of colorectal cancer: the Women's Health Initiative Randomized Controlled Dietary Modification Trial. *Journal of the American Medical Association* **295**, 643–654.

Blamey A, Ayana M, Lawson L, Mackinnon J, Paterson I & Judge K (2005) Final report: The independent evaluation of Have a Heart Paisley. https://www.scotland.gov.uk/Resource/Doc/37428/0012626.pdf

Bolling K (2006) *Infant feeding Survey 2005: Early Results*. London: The Information Centre.

Bowering J, Morrison MA, Lowenburg RL & Tirado N (1976) Role of EFNEP (Expanded Food and Nutrition Education Program) aides in improving diets of pregnant women. *Journal of Nutrition Education* **8**, 111–117.

British Family Heart Study Group (1994) Randomised controlled trial evaluating cardiovascular screening and intervention in general practice: principal results of British family heart study. Family Heart Study Group. *British Medical Journal* **308**, 313–320.

British Heart Foundation (2006) Heart disease death rate statistics. http://www.bhf.org.uk/news (accessed September 2006).

Bromley C, Sproston K & Shelton N (editors) (2005*a*) Scottish Health Survey 2003. vol. 1: Cardiovascular disease and related factors. http://www.scotland.gov.uk/Resource/Doc/76169/0019727.pdf

Bromley C, Sproston K & Shelton N (editors) (2005*b*) Scottish Health Survey 2003. vol. 2: Adults. http://www.scotland.gov.uk/Resource/Doc/76169/0019729.pdf

Bytzer P, Howell S, Leemon M, Young LJ, Jones MP & Talley NJ (2001) Low socioeconomic class is a risk factor for upper and lower gastrointestinal symptoms: a population based study in 15 000 Australian adults. *Gut* **49**, 66–72.

Carleton RA, Lasater TM, Assaf AR, Feldman HA & McKinlay S (1995) The Pawtucket heart health program: community changes in cardiovascular risk factors and projected disease risk. *American Journal of Public Health* **85**, 777–785.

Centers for Disease Control and Prevention (2006) WISEWOMAN. A Crosscutting Program to Improve the Health of Uninsured Women. At a Glance 2006. http://www.cdc.gov/nccdphp/publications/aag/wisewoman.htm

Chipman H & Kendall P (1989) 20 years of EFNEP: changes and challenges. *Journal of Nutrition Education* **21**, 265–269.

Dahlgren G & Whitehead M (1991) *Policies and Strategies to Promote Social Equity in Health*. Stockholm, Sweden: Institute for Further Studies.

Department of Health and Human Services, National Institutes of Health, National Heart, Lung, and Blood Institute (2006) Women's Health Initiative. http://www.nhlbi.nih.gov/whi/

Dyson L, McCormick F & Renfrew MJ (2006) Interventions for promoting the initiation of breastfeeding. *The Cochrane Database of Systematic Reviews*, issue 3, CD001688. Chichester, West Sussex: John Wiley & Sons Ltd.

Fairbank L, O'Meara S, Renfrew MJ, Woolridge M, Sowden AJ & Lister-Sharp D (2000) A systematic review to evaluate the effectiveness of interventions to promote the initiation of breastfeeding. *Health Technology Assessment* **4**(25), 1–172; available at http://www.ncchta.org/fullmono/mon425.pdf

Farquhar JW, Fortmann SP, Flora JA, Taylor CB, Haskell WL, Williams PT *et al.* (1990) Effects of community wide education of cardiovascular risk factors: the Stanford five-city project. *Journal of the American Medical Association* **264**, 359–365.

Food Standards Agency (2006) Low Income Diet and Nutrition Survey. http://www.food.gov.uk/science/101717/lidnsbranch/

Freedman LS, Potischman N, Kipnis V, Midthune D, Schatzkin A, Thompson FE, Troiano RP, Prentice R, Patterson R, Carroll R & Subar AF (2006) A comparison of two dietary instruments for evaluating the fat-breast cancer relationship. *International Journal of Epidemiology* **35**, 1011–1021.

Glennerster H, Hills J, Piachaud D & Webb J (2004) *One Hundred Years of Poverty and Policy*. York: Joseph Rowntree Foundation; available at http://www.jrf.org.uk/bookshop/eBooks/1859352227.pdf

Gregory J, Collins D, Davies P, Hughes J & Clarke P (1995) *National Diet and Nutrition Survey: Children Aged 1½ to 4½ Years*. London: H. M. Stationery Office.

Hanlon P (1992) The Good Hearted Glasgow Campaign. In *The Community Prevention of Coronary Heart Disease*, pp. 181–187 [K William, editor]. Edinburgh: H. M. Stationery Office.

Harder T, Bergmann R, Kallischnigg G & Plagemann A (2005) Duration of breastfeeding and risk of overweight: a meta-analysis. *American Journal of Epidemiology* **162**, 397–403.

Hoare J & Henderson L (2004) *The National Diet and Nutrition Survey: Adults Aged 19 to 64 Years*. London: Food Standards Agency.

Howard BV, Van Horn L, Hsia J, Manson JE, Stefanick ML, Wassertheil-Smoller S *et al.* (2006) Low-fat dietary pattern and risk of cardiovascular disease: the Women's Health Initiative Randomized Controlled Dietary Modification Trial. *Journal of the American Medical Association* **295**, 655–666.

James WP, Nelson M, Ralph A & Leather S (1997) Socioeconomic determinants of health. The contribution of nutrition to inequalities in health. *British Medical Journal* **314**, 1545–1549.

Khaw KT, Bingham S, Welch A, Luben R, Wareham N, Oakes S & Day N (2001) Relation between plasma ascorbic acid and mortality in men and women in EPIC-Norfolk prospective study: a prospective population study. European Prospective Investigation into Cancer and Nutrition. *Lancet* **357**, 657–663.

Krummel DA, Koffman DM, Bronner Y, Davis J, Greenlund K, Tessaro I, Upson D & Wilbur J (2001) Cardiovascular health interventions in women: What works? *Journal of Women's Health and Gender-based Medicine* **10**, 117–136.

Luepker RV, Murray DM, Jacobs DR, Mittelmark MB, Bracht N, Carlaw R *et al.* (1994) Community education for cardiovascular disease prevention: risk factor changes in the Minnesota heart health program. *American Journal of Public Health* **84**, 1383–1393.

McLaren GL & Bain MRS (1998) *Deprivation and Health in Scotland: Insights from NHS Data*. Section 7: *Cancer*. Edinburgh: ISD Scotland Publications; available at http://www.show.scot.nhs.uk/publications/isd/deprivation_and_health/cancer.htm

Mayhew E & Bradshaw J (2005) Mothers, babies and the risks of poverty. *Poverty* **121**, 13–16.

Newton T, Williams A & Bower E (2005) *Access to Dental Health Services in Scotland. Health Committee Report. SP Paper* 277. Edinburgh: Scottish Parliament.

Palmer G, Carr J & Kenoway P (2005) *Monitoring Poverty and Social Exclusion 2005*. York: Joseph Rowntree Foundation New Policy Institute.

Petersen S, Peto V, Scarborough P & Rayner M (2005) *Coronary Heart Disease Statistics*. London: British Heart Foundation.

Prentice R, Caan B, Chlebowski RT, Patterson R, Kuller LH, Ockene JK *et al.* (2006) Low-fat dietary pattern and risk of invasive breast cancer: the Women's Health Initiative Randomized Controlled Dietary Modification Trial. *Journal of the American Medical Association* **295**, 629–642.

Rajopal R, Cox RJ, Lambur M & Lewis EC (2002) Cost-benefit analysis indicates the positive economic benefits of the Expanded Food and Nutrition Education Program related to chronic disease prevention. *Journal of Nutrition Education and Behavior* **34**, 26–37.

Rosamond WD, Ammerman AS, Holliday JL, Tawney KW, Hunt KJ, Keyserling TC, Will JC & Mokdad AH (2000) Cardiovascular disease risk factor intervention in low-income women: the North Carolina WISEWOMAN project. *Preventive Medicine* **31**, 370–379.

Rush D, Horvitz DG, Seaver WG, Aluir JM, Garbowski GC, Leighton J, Sloan NL, Johnson SS, Kulka RA & Shanklin DS (1988) The National WIC evaluation. Background and introduction. *American Journal of Clinical Nutrition* **48**, 389–393.

Scientific Advisory Committee on Nutrition (2002) Paper for information: Government update on nutrition related activities – Food Standards Agency. http://www.sacn.gov.uk/pdfs/sacn_02_17.pdf

Stead M, Caraher M, Wrieden W, Longbottom P, Valentine K & Anderson A (2004) Confident, fearful and hopeless cooks: Findings from the development of a food-skills initiative. *British Food Journal* **106**, 274–287.

Stein K (2006) After the media feeding frenzy: whither the Women's Health Initiative Dietary Modification Trial? *Journal of the American Dietetic Association* **106**, 794–795.

Steptoe A, Perkins-Porras L, McKay C, Rink E, Hilton S & Cappuccio FP (2003) Behavioural counselling to increase consumption of fruit and vegetables in low income adults: randomised trial. *British Medical Journal* **326**, 855.

Stockley L (2001) Toward public health nutrition strategies in the European Union to implement food based dietary guidelines and to enhance health. *Public Health Nutrition* **4**, 307–324.

Stoddard AM, Palombo R, Troped PJ, Sorensen G & Will JC (2004) Cardiovascular disease risk reduction: the Massachusetts WISEWOMAN project. *Journal of Women's Health* **13**, 539–546.

Tudor Smith C, Nutbeam D, Moore L & Catford J (1998) Effects of the Heartbeat Wales programme over five years on behavioural risks for cardiovascular disease: quasi-experimental comparison of results from Wales and a matched reference area. *British Medical Journal* **316**, 818–822.

US Department of Agriculture (2001) Expanded Food and Nutrition Education Program. FY 2001. Program Impacts. http://www.csrees.usda.gov/nea/food/efnep/pdf/01-1 facts.pdf

US Department of Agriculture Food and Nutrition Service (2006) About WIC. http://www.fns.usda.gov/wic/aboutwic/

Viadro CI, Farris RP & Will JC (2004) The WISEWOMAN projects: lessons learned from three states. *Journal of Women's Health* **13**, 529–538.

Warren J (2005) Breastfeeding promotion and support in Scotland 1990–2005. http://www.breastfeed.scot.nhs.uk/Breastfeeding_Promotion_and_Support_in_Scotland_1990-2005.htm

Whitlock EP & Williams SB (2003) The primary prevention of heart disease in women through health behavior change promotion in primary care. *Women's Health Issues* **13**, 122–141.

Wilson AS, Forsyth JS, Greene SA, Irvine L, Hau C & Howie PW (1998) Relation of infant diet to childhood health: seven year follow up of cohort of children in Dundee infant feeding study. *British Medical Journal* **316**, 21–25.

World Health Organization/Food and Agriculture Organization (2003) *Diet, Nutrition and the Prevention of Chronic Disease*. Geneva: WHO.

Wrieden WL, Anderson AS, Longbottom PJ, Valentine K, Stead M, Caraher M, Lang T, Gray B & Dowler E (2007) The impact of a community-based food skills intervention on cooking confidence, food preparation methods and dietary choices – an exploratory trial. *Public Health Nutrition* (In the Press).

Wrieden WL, Connaghan J, Morrison C & Tunstall-Pedoe H (2004) Secular and socio-economic trends in compliance with dietary targets in the north Glasgow MONICA population surveys 1986–1995: did social gradients widen? *Public Health Nutrition* **7**, 835–842.

Wrieden WL & Symon A (2003) The development and pilot evaluation of a nutrition education intervention programme for pregnant teenage women (food for life). *Journal of Human Nutrition and Dietetics* **16**, 67–71.

Yip R, Binkin N, Fleshwood L & Trowbridge F (1987) Declining prevalence of anaemia among low income children in the United States. *Journal of the American Medical Association* **258**, 1619–1623.