

Evaluation of public health approaches of obesity prevention and
management in England: lessons learned for Brunei

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Abstract

Tackling obesity is a major public health challenge. Obesity strategy and policy in England has been heavily criticised for being ineffective in tackling the problem of obesity. Although many studies have evaluated interventions for obesity, there is no clear evidence about which interventions are effective in the prevention and management of obesity in primary care and community settings. The main purpose of the study was to evaluate the effectiveness of current public health approaches for obesity prevention and management, in particular focusing on behaviour change models as intervention and also policy actions implemented at local level (primary care trusts) in England. It also intended to identify obesity strategies relevant to Brunei as lessons learned from England. The methods used were systematic review, policy analysis and validation. The main finding of this study had shown that the ‘Transtheoretical model stages of change’ used in combination with diet and physical activity has limited impact on weight loss (about 2 kg or less) and there was no conclusive evidence for sustainable weight loss beyond 12 months. In addition, there were significant variations found in obesity strategies implemented by primary care trusts in north-west London based on analysis using the Imperial College Obesity Strategy Assessment Framework. The key lesson learned for Brunei from England’s experiences was the development and application of Brunei-IC-OSAF that contributed to the formulation of ‘comprehensive obesity policy’ for Brunei. The tool had identified strengths and weaknesses of the existing obesity strategies implemented in the country. The outcomes of the study contributed to the existing evidence about what works in tackling obesity in public health settings, informing better pathway development and commissioning decisions.

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Declaration of originality

The work presented in this thesis is my own and all other sources of information are appropriately referenced. I have defined the scope of the thesis and discussed the analyses and results of this study with my main supervisor, Professor Azeem Majeed and obtained some guidance from Dr Sonia Saxena and Dr Balvinder Kaur. From this work, two publications were produced in peer-reviewed journals. The title of the first is ‘Development and application of the Imperial College Obesity Strategy Assessment Framework for analysing local obesity strategies’, which was published in the ‘Journal of Primary Health Care and Research and Development’ in 2010. The second publication was titled ‘Transtheoretical model for dietary and physical exercise modification in weight loss management for overweight and obese adults’, which appeared in the Cochrane Database of Systematic Reviews. I have generated original findings for this work based on the data gathered, assessed and analysed using rigorous methods throughout the duration of the study.

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List of abbreviations

BMI	Body mass index
BCM	Behaviour change model
BP	Blood pressure
BNNS	Brunei National Nutritional Status Survey
CHD	Coronary heart disease
CI	Confidence interval
CRP	Cardiac rehabilitation programme
DHS	Director of health services
EPF	Eightfold path framework
GIS	Geographical information systems
GP	General practitioner
FIS	Family information service
HDA	Health development agency
H&F	Hammersmith and Fulham
HIA	Health impact assessment
HPAF	Health policy analysis framework
HSE	Health survey England
HPC	Health promotion centre
HPS	Health promoting school
HE	Health education
HPB	Health promotion blueprint
ITT	Intention-to-treat
IC-OSAF	Imperial College Obesity Strategy Assessment Framework
IHSHPCS	Integrated health screening and health promotion programme for civil servants
LDL	Low density lipoprotein
LOCF	Last-observation-carried-forward
LAA	Local area agreement
MD	Mean difference
MEND	Mind, Exercise, Nutrition, Do it
MOH	Ministry of health
MCH	Maternal and child health
MOE	Ministry of Education
NICE	National institute for health and clinical excellence
NHS	National health service
NSF	National service framework
NIDDM	Non-insulin-dependent diabetes mellitus
NCMP	National child measurement programme
NCDs	Non-communicable diseases
OR	Odd ratio
PA	Physical activity
PCT	Primary care trust
P	P-value
PRISMA	Preferred reporting items for systematic reviews and meta-analyses
QOF	Quality and outcome framework
RCT	Randomised controlled trial
RR	Relative risk
RIPAS	Raja Isteri Pengiran Anak Saleha
TTM	Transtheoretical model
TRA	Theory of reasoned action
TPB	Theory of planned behaviour
SOC	Stages of change
SET	Self-efficacy theory
SLT	Social learning theory

SCT	Social cognitive theory
SD	Standard deviation
SE	Standard error
SMBG	Self monitoring blood glucose
UK	United Kingdom
WHO	World Health Organisation
WC	Waist circumference
WHR	Waist and hip ratio
WHtR	Waist-to-height ratio
WMD	Weighted mean difference

1.0. Introduction

1.1. Background

Obesity is a major global public health threat due to increasing trends in overweight and obesity among adults and children in many developed and developing countries. In 2008, the World Health Organisation (WHO) estimated approximately 1.5 billion adults (age 15 and above) were overweight and at least 500 million adults were obese. In 2010, at least 43 million children under the age of five years were overweight (1). In the United Kingdom (UK), the proportion of adults with obesity has significantly increased in recent decades, with no signs of any reversal in this trend. For example, between 1993 to 2006, the percentage of men categorised as obese (BMI 30 or over) increased from 13.2% to 23.7%; with a 16.4% to 24.2% increase in women. The proportion of adults with normal BMI decreased over the same period from 41.0% to 31.7% in men and 49.5% to 41.8% in women (2). If interventions for obesity continue to be ineffective, 12 million adults and 1 million children will be obese in the UK by 2010. There will be a shift of 3.5 million adults, who were previously within a healthy weight range or with a BMI of less than 30 kg/m², into either the overweight or obese range, by 2010 compared to 2003 (3, 4). The Foresight Report predicts further increases in obesity. It states that by 2050, 60% of men, 50% of women and 25% of children in the UK could be obese (3).

The fundamental cause of obesity and overweight is an energy imbalance between calories that are consumed and those that are expended. The main contributing factor behind the increase in overweight and obesity in many countries is a global shift in diet. This comprises an increased intake of energy-dense foods (high in fat and sugars) with a reduced intake of vitamins, minerals and other micronutrients (1). Physical inactivity (5) and dietary patterns (6) are important risk factors for obesity. Other contributing factors include biological (7, 8), genetic (9, 10), environmental (e.g. changing modes of transportation and increasing urbanisation) and societal factors (11, 12).

The consequences of obesity are significant impairments of health and longevity in individuals as well as representing a substantial economic burden on a nation. Diabetes, heart disease, hypertension, cancer and osteoarthritis are all more common in overweight and obese people (1, 13). Obesity reduces quality-adjusted life expectancy by around three years in males and six years in females (14, 15). In the UK, approximately 8.7% of deaths are estimated to be a result of excess weight (16), with severely obese individuals on average dying 11 years earlier than non-obese people (13). Furthermore, obesity has huge economic implications for the country. Both direct treatment costs and the indirect costs, such as sickness absence, produce an economic burden with estimated total annual costs of £3.5 billion in 2002 (17). The Foresight Report predicts that the National Health Service (NHS) spending on overweight and obesity will reach £10 billion per year by 2050, with the wider societal costs estimated to reach around £50 billion per year (3). In the United States, the medical care costs of obesity were approximately \$147 billion in 2008 (18).

There are two main types of public health intervention strategies to tackle obesity, which are to improve the knowledge and skills of individuals in a community, and to reduce the exposure of populations to the underlying environmental causes of obesity (19-21). It is imperative that the strategic public health actions focus on wider issues such as developing national dietary guidelines, policies on the importation of food and pricing (22), and improving the standard of living of all sectors of society, particularly in minority populations (19-21). The common treatments for obesity among adults are physical activity (PA) (23), behaviour modification (24), dietary management, drug therapy and gastric surgery (19, 20, 25).

1.2. UK experience

The UK Department of Health Report 'Tackling Obesity in England 2001', states that most health-related contact with overweight and obese people within the NHS occurs in general practice (GP). The report highlighted that surgery and drug treatment are potentially effective interventions in the management of overweight and obese patients. Other interventions include: dietary management, physical activity (PA) and cardiovascular risk assessment. The

National Service Framework (NSF) for Coronary Heart Disease (CHD) and The National Institute for Health and Clinical Excellence (NICE) are commonly used sources of guidelines used by General Practitioners (GPs) in the management of patients with obesity (26).

The House of Commons Health Committee report for 2004 discussed important issues in obesity management in primary care among overweight and obese adults in the UK. The report outlined some key limitations in current UK primary care. These include: the ineffective implementation of obesity guidelines, such as the NSF CHD and NICE guidelines, and limited patient access to various obesity treatment regimes, such as drugs, behavioural interventions and specialist medical care. The report stated that the main reason for this is that obesity remains a low priority for the majority of service commissioners and providers in the NHS. It is also evident that resources to provide structured, long-term interventions to tackle obesity in primary care were simply not available. The report added: ‘...NICE has made many pronouncements on weight management and the use of drugs for surgery, but they are only accepted at a distance by health authorities and not always acted upon...’ (p.103) (17)

1.3. Issues

Many studies had evaluated the effectiveness of public health interventions such as dietary and physical-exercise interventions for obesity management among overweight and obese individuals, and have reported moderate weight loss, mainly at up to 12 months follow up (25, 27-35). While, a key finding of a review showed lack of evidence on the impact of policies, programmes and other interventions to stimulate healthy eating and PA for obesity (36)

The NHS Health Development Agency (HDA) reported a similar issue in the review of evidence for the management of obesity and overweight. It stated mixed and inconclusive evidence of effectiveness for community-based interventions among adults. Among gaps in the evidence, there was a lack of research focusing on the following: prevention of obesity

and overweight, the maintenance of weight loss in adults and children, and for ‘upstream’ interventions (37). These upstream interventions comprise of policies or strategies at national or regional level that focus on population and environmental strategies. The ineffectiveness of obesity management in England may also be related to ineffective implementation of obesity strategies and policies at a local population level (17).

There was no clear evidence about which interventions were effective in the prevention of obesity and overweight, as well as sustainable weight loss. Evidently, there were gaps in the literature on evidence on the effectiveness of interventions for overweight and obesity management in public health setting.

1.4. Research questions and hypothesis

This study attempted to address these gaps by evaluating public health approaches implemented in England for the prevention and management of overweight and obesity. The general research questions posed were ‘What interventions work in the prevention and management of obesity among adults in the public health settings?’ and ‘How effective is the current public health interventions for obesity prevention and management?’ While, the specific research questions were ‘Does behaviour change models (BCMs) used in combination with diet and PA interventions resulted in sustainable weight loss (over a period one year) among overweight and obese adults?’ and ‘Why policy action interventions might be ineffective in the prevention and management of obesity at local level in England?’

The study hypothesised that ‘BCMs use in combination with diet and PA as intervention may resulted in weight loss among overweight and obese individuals, and the weight loss is maintained over a period of one year’; and ‘variations in obesity strategies at local levels may contribute to ineffective implementation of ‘upstream’ intervention for obesity in England’. It was also anticipated that BCM with dietary and PA as intervention and supported with

effective implementation of policy actions are more likely to produce positive results compared with conventional public health approaches in tackling obesity.

1.5. Aim and objectives

The study aimed to evaluate the effectiveness of current public health approaches for obesity prevention and management, in particular focusing on behaviour change models (BCMs) as intervention for weight loss among overweight and obese adults and also policy actions ('upstream' interventions) that are implemented at local (community) level in England.

England's experiences in tackling obesity can become a benchmark for developing countries like Brunei Darussalam. Similarly, obesity is an important public health issue in Brunei Darussalam and has become a huge burden on the nation. Therefore, this study also intended to identify policy strategies relevant to Brunei as lessons learned from England. The objectives of the study were to:

1. examine the common public health interventions implemented in the prevention and management of overweight and obesity
2. assess the evidence on the effectiveness of Transtheoretical Model (TTM) Stages of Change (SOC) used in combination with other strategies (such as dietary and physical exercise) as intervention for lifestyle modification for weight loss among overweight and obese adults
3. examine the existing strategies for the prevention and management of obesity which are implemented at local primary care trusts (PCTs) levels in North-West England and Brunei Darussalam.
4. determine the validity of the tool used in examining the strategies for the prevention and management of obesity which are implemented at local (PCTs) levels in North-West England and Brunei Darussalam.

In this study, the methods used were literature review, policy analysis and validation to assess the effectiveness of multifaceted public health interventions used in the prevention and management of overweight and obesity in England and Brunei Darussalam.

2.0. Literature review

In this chapter, the literature review questions addressed were:

1. What are the common measures of obesity?
2. What are the risk factors and contributing factors for obesity among adults?
3. What interventions work in the prevention and management of obesity among adults in the public health settings?
4. How strong is the evidence on its effectiveness?

2.1. Methods

In this literature review, the types of articles included were reports, review articles and primary studies and published in English language from 1980 to 2013. Overweight and obesity were defined based on WHO and NICE guidelines and the standard measurement parameters considered were BMI, waist measurement and waist-to-hip-ratio. The exclusion criteria for the review are: participants who are children or teenagers (under the age of 18 years), studies conducted in hospital settings, intervention using surgical approaches only and anti-obesity drugs for obesity management, and publications before 1980 and in languages other than English.

The main search methods for identification of articles were using electronic databases and hand-searching. For the electronic search, I used the following sources:

- The Cochrane Library (issue 10, 2010);
- Medline (until December 2013)
- PubMed (until December 2013)

For the literature search, keywords used were overweight, obesity, risk factors, BMI, waist circumference (WC), waist hip ratio, public health, behaviour change, diet, PA, adult and weight loss. Additional key words of relevance detected during the electronic or other searches were incorporated and the search strategies were modified accordingly. The library

resources were mainly at Imperial and British Library if potentially relevant articles were cited but not available via databases or web sites. Critical appraisal approach and checklist applied to assess the quality of included studies was based on ‘A review guide to the critical-appraisal process’ (38).

2.2. Definitions of Overweight and Obesity

In this study, definitions of overweight and obesity are based on the classification of healthy weight, overweight and obesity from both WHO and NICE.

Overweight and obesity is an abnormal or excessive fat accumulation that may impair health. ‘Overweight’ refers to a BMI (BMI) equal to or more than 25, and ‘obesity’ as a BMI is equal to or more than 30 (1). The National Institute of Clinical Excellence (NICE) considers healthy weight as a BMI of 18.5-24.9 kg/m² and further classifies overweight and obesity as, BMI 25-29.9 kg/m² (overweight), BMI 30-34.9 kg/m² (obesity I), BMI 35-39.9 kg/m² (Obesity II) and BMI 40 kg/m² or more (Obesity III) (39).

2.3. Measures for Obesity

Obesity among adults can be measured using parameters such as BMI, WC and waist and hip ratio (WHR). BMI is a simple index of weight in relation to height that is commonly used in classifying overweight and obesity in adults. It is defined as the weight in kilograms divided by the square of the height in meters (kg/m²). WC refers to measurement at midway level between lower rib margin and iliac crest that is often measured in centimetres. The cut-off point for WC for men is more than 94cm whereas it is more than 80cm for women. The WHR is calculated by dividing WC (cm) and hip circumference (cm). The cut-off values for WHR for men are more than 0.90cm and 0.85cm in women are 0.85cm (1, 40)

BMI is the most useful population-level measure overweight and obesity as it is the same for both sexes and for all ages of adults, but it may not correspond to the same degree of fatness in different individuals (1). The NICE guidelines argued that BMI can be a less accurate measure of adiposity in adults who are highly muscular as the individuals might have a relatively high BMI despite not being clinically overweight or obese (39). There is a wide debate in the literature on which measures of obesity is best measurement of body fitness and predictor of metabolic syndrome (MetS) (41-45).

Studies have shown that BMI does not account for body fat distribution and is a weak discriminatory index between excess adipose tissue and high lean muscle mass (42, 43). A recent meta-analysis review of 10 studies with total of 88, 514 participants showed that BMI was the poorest discriminator for cardiovascular risk factors among adults (aged 18 years to >35 years). Waist-to-height ratio (WHtR) was the best discriminator for hypertension, diabetes, and dyslipidemia in both sexes; its pooled AUC (95% CIs) ranged from 0.67 (0.64, 0.69) to 0.73 (0.70, 0.75) and from 0.68 (0.63, 0.72) to 0.76 (0.70, 0.81) in males and females, respectively (44). The review main methodological flaw was the sample size of each included studies was not reported for intervention and control groups. The missing information of each included studies was accounted for. Therefore, it is quite difficult to examine the effects of small studies on the overall results of the included studies.

Meanwhile, WC has strong correlation with abdominal fat and is associated with cardiovascular risk factors than BMI (46, 47). Similarly, meta-analysis review of 15 studies and 258,114 participants included had shown that WC and WHR were measurements for abdominal obesity and had significant association with the risk of incident cardiovascular disease (CVD) events. There was an association with a 2% (95% CI: 1–3%) increase in risk of future CVD when WC was increased by 1cm and a 0.01 increase in WHR was associated with a 5% (95% CI: 4–7%) increase in risk. WC and WHR were simple measures of abdominal obesity that should be incorporated in CVD risk assessments. The study has few methodological limitations such as the WC and WHR was not defined and cut-off points were not stated. The included studies with small total sample size may had small differences in risk and this might not be detected in the data analysis (48).

Another cross sectional study done in Qatar among 1552 adults showed that among men WC (0.78; 95% CI 0.74–0.82 and 0.75; 95% CI 0.71–0.79) followed by WHR and WHtR produced the highest sensitivity and specificity, whereas among women WC (0.81; 95% CI 0.78–0.85 & 0.79; 95% CI 0.76–0.83, resp.) was higher than WHtR. In this study, WC was the best predictor of metabolic syndrome at cut-off 99.5cm for men and women was 91cm. In both gender, BMI had lowest sensitivity and specificity (49). The main limitation of the methods used include the design was not able to draw temporal relationship and causal inferences, recruitment sampling attrition rate was quiet high (29%) and source of validated data collection tool and language used were not reported therefore the results might not be generalize able to other countries with different ethnicity.

However, WHtR is significantly better surrogate for measuring abdominal obesity as reported by some studies (50, 51). A large systematic review and meta-analysis of 31 studies conducted in 18 countries (with total participants of 305, 851 and aged range of 18 to 100 years) showed that WHtR to be significantly better than WC for diabetes, hypertension, CVD and all outcomes ($p < 0.005$) in both sexes, and therefore should be considered as a screening tool. The WHtR had significantly greater discriminatory power compared with BMI. WC improved discrimination of adverse outcomes by 3% ($P < 0.05$) when compared with BMI, while WHtR improved discrimination by 4–5% over BMI ($P < 0.01$) (50). The main limitations of the method were the terminology of measures (BMI, WC and WHtR) and the cut-off points used in included studies can be inconsistent that may led to variations in the measurements. Furthermore, the participants and outcomes measured in the review were not clearly stated.

2.4. Causes of obesity and the risk factors

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and expended (19, 20). The contributing factors of obesity include biological (52, 53) and genetic. The risk factors for obesity were considered to be physical inactivity (5),

dietary patterns (e.g. a high intake of energy-dense, micronutrient-poor foods), sedentary lifestyles, adverse social and economic conditions and gender (6).

Signalling mechanism for body weight regulation

There was a range of signalling mechanisms found within the intestine, the adipose tissue, brain and maybe other tissues for body weight regulation. The signalling triggers specific receptors, sensing the inflow of dietary nutrients (including their distribution, metabolism and storage) that are coordinated within the brain. The process results in changes to dietary intake, PA and body metabolism to allow energy stores to be maintained in the body (19, 20). Evidence from a current review showed that leptin and ghrelin are the two hormones that regulates food intake and body weight in humans. Leptin can induce weight loss by acting as a mediator of long-term regulation of energy balance and suppressing food intake, whereas ghrelin is a fast-acting hormone and play a role in meal initiation. There is an increase in the circulating level of the anorexigenic hormone leptin, and there is a decreased level of the orexigenic hormone ghrelin in obese individuals. In another words, obese individuals are leptin-resistant and the development of obesity may be caused by abnormalities in the leptin and ghrelin systems (52). The main limitation of this review is the method used was not reported (including search strategy, databases, inclusion criteria, selection of included studies and assessment of quality). Meanwhile, a review on stress-response network and glucocorticoid (GC) secretion in obesity reported that emotional stress resulted with increased motivation for food and insulin production that led to excess food intake and obesity. The feeling of stress can be reduced when eating highly palatable foods, and thus this reinforced the feeding habit and stress-response network (53). The review was subjected to flaws including databases, protocol used and method of data extraction was not reported. In addition, the assessment of quality for each included study was not conducted.

Genetic

The interactions between human genes and the environment may explain the fact that some individuals have a tendency to accumulate excessive fat in their body and struggle to lose weight compared to others. There is evidence showing significant associations between high fat intake and weight gain amongst those individuals who had obese parents, and similar findings were found amongst identical twins (19, 20). Few studies had established that obesity has genetic link (9, 10). A meta-analysis of 61 studies (with a total of 80,957 cases and 220,223 controls) in Europe had shown that polymorphism (rs17782313) near the melanocortin 4 receptor (MC4R) gene was significantly associated with obesity risk (OR=1.18, 95%CI=1.15-1.21, $p<0.001$). There were similar trends observed among subgroups of Europeans and East Asians, adults and children (54). The main limitation of the review was used of protocol and outcomes measured were not reported in the review, therefore issues of selecting reporting and inconsistent measures of obesity in each included study may affect the results.

Dietary patterns

Obesity is often associated with various dietary factors, such as macronutrient composition, energy intake, energy storage and macronutrient balance, food palatability and pleasure, macronutrient influence on body weight regulation, dietary patterns and eating disorders. For example, the composition of macronutrients in diet (such as protein, carbohydrate and fat) has variable storage capacities within the body that contributes to excess energy being stored within the body. The main principle is that macronutrients with low storage capacity will automatically be oxidized when their intake reaches the maximum level of an individual's body requirements. Proteins and carbohydrates both have limited storage capacity in the forms of body protein and glycogen respectively. Both macronutrients are strictly regulated so that any excess amounts are readily oxidised by the body. Fat has substantial storage capacity in the body and is not automatically oxidised, even when an excessive amount is present within the body. It is readily stored in adipose tissue with a very high efficiency (19, 20). A review done by Swinburn et al. showed that diet high in non-starch polysaccharides (NSP) or dietary fibre prevent weight gain and are therefore protective against obesity. Diet

high in energy-dense micronutrient food contributes to excessive caloric intake which in turn leads to weight gain and promote obesity (6). The review did not clearly describe the design, participant, intervention and outcomes measured in each included study. In addition, the quality assessment tool used was not reported therefore the results of this review were subjected to bias such as selection and reporting biases.

Physical inactivity

Meanwhile, the physiological regulation of an individual's body weight (including total energy expenditure, fat balance and intakes) is significantly affected by PA patterns. The individual's total amount of energy expenditure is often determined by the person performing exercise (i.e. body size, level of habituation and fitness) and the characteristics of the PA performed such as mode, intensity, duration and frequency (19, 20). A review of 20 prospective observational studies on relationship of PA and sedentary behavior in the development of overweight and adiposity showed sedentary behaviour was directly associated with weight and there was no association between PA and fatness outcomes. Physical inactivity restricted the utilisation of calorie intake which in turn conserve as fat and may not resulted in excess body weight (5) The method of the review had few limitations such as: review protocol not stated and quality assessment tool not indicated for each included studies, therefore there were subjected to biases.

Environmental and societal factors

According to WHO, the environmental and societal factors contributing to the rapid increase in obesity rates over recent decades affecting populations in many developed and developing countries include: changes in societal structures; modernisation; new-world syndrome; economic restructuring and transition to market economies; increasing urbanisation; changes in the role of women; changes in social structures; globalisation of world markets; and variation within societal and cultural influences. At an individual level, these factors have a

significant impact on food intake and PA patterns that may result in negative effects on the physiology of body weight regulations in the long-term (19, 20).

Few studies had reported strong relationship between obesity and environmental and societal factors (11, 12). For instance, a review on prevalence and risk factors of obesity and obesity related diseases such as diabetes and cardiovascular disease (CVD) in Asian countries showed that migration from rural to urban areas, and rapid socio-economic transition are associated with the lifestyle changes resulting in decreased levels of PA and increased intake of an energy-dense diet. The rates of urbanization in most Asian countries were substantial and varied, where more than 60% of the population in Singapore, Korea, Malaysia, the Philippines and Indonesia live in urban areas whereas in China, Pakistan, India and Thailand the estimated rate was more than 30%. Urbanization resulted in decreased PA, BMI and a substantial increase in upper body adiposity because of easy access to diverse diets with an excess of refined carbohydrates, processed foods, saturated and total fat, and lower content of fiber (11). The review has several limitations such as inclusion criteria, databases used, protocol for review and methods of data extraction and analysis were not stated. In addition, quality assessment of each included study was not conducted.

At individual level, a cross-sectional study of 268 first year university students in the UK assessed stress and perceived weight change reported 55 percent of the participants had weight gain (1.53 kg \pm 2.70, $p < 0.001$), whereas 12 percent had weight loss and 33 per cent had stable body weight status. Stress was associated with greater risk of weight gain (OR, 1.27, 95% CI, 1.12 to 1.44, $p = 0.001$) and weight loss (1.33, 1.10 to 1.61, $p = 0.003$) in both men and women, however the associations were stronger among women (12). The key limitation of this study was lack of generalisability of the findings to other population and setting as the recruited participants were youth from one university in the UK.

Gender

Gender is another factor that contributes to an individual's susceptibility to weight gain and obesity. Females have a tendency to channel extra energy into fat storage, whereas males use it for protein synthesis. The process that tends to affect females is also known as 'nutrient partitioning' and it actually contributes to the additional positive energy balance and fat deposition (19, 20). Conversely, a study done to assess the effects of protein intake diet (normal protein and high protein) and sex on body composition among 43 male and 45 females overweight and obese adults reported that men lost more fat mass (FM) (-5.0 vs -3.9 kg) from the trunk and less from legs (-1.7 vs -2.1 kg) than women ($P < .05$) at 12 weeks, which resulted in a greater decrease of the android-to-gynoid fat ratio for the men. There was no association between protein intake and sex-specific responses on changes in FM, however bone mineral density was reduced in women, but not in men (55). The study sample was small and the sampling method was not clearly explained, therefore the results of the study were not generalisable.

Ethnicity

Some ethnic groups in many industrialised countries tend to be susceptible to the development of obesity and its complications. For instance: the prevalence of non-insulin-dependent diabetes mellitus (NIDDM) and deaths from CHDs are higher in people of South Asian (particularly Bangladeshi, Indian and Pakistani) descent living in urban societies than in other ethnic groups. These individuals are more likely to accumulate intra-abdominal fat for a given BMI in comparison to other populations (19, 20). Similarly, a cross sectional study on the effects of acculturation on obesity rates in ethnic minorities in England showed that Indian (OR: 1.76, 1.14–2.71) and Chinese (OR: 3.65, 1.37–9.78) groups were more likely to be obese in the second generation than the first (when adjusted for age and sex) and there was no significant difference observed in the rest of the groups. The seven ethnic minority groups included were Indian (1580), Pakistani (1858), Bangladeshi (1549), Black Caribbean (1472), Black African (587), Chinese (1559) and Irish (889). Despite this, the risk of obesity in all groups congregated between generations to the risk observed in the White reference group except for the Black Caribbean group. The risk of obesity increased in the second generation in all groups when adjusted for mix patterns of acculturative changes and rising

social mobility (56). The finding of this study has limited generalizability, as the participants were recruited from specific geographical locations.

Conversely, a review of 29 studies done in UK had found lack of consensus on obesity prevalence among both South Asian or Black children and adults relative to Caucasians. Black adults generally had higher risk for obesity than Caucasians. Both Chinese children and adults had lower risk for obesity than Caucasians. It was found that obesity metrics might contribute to bias on obesity prevalence among particular ethnic groups relative to Caucasians (57). The review has major limitations including participant (age, gender, setting) and outcomes (measures of obesity) measured were not clearly defined, review protocol was not reported and data extraction and appraisal by two reviewers was not mentioned. In addition, quality assessment and potential source of bias in each included study was discussed, therefore the results of the review might not be accurate in presenting evidence of ethnicity and obesity in the UK.

2.5. Burden of obesity

Obesity has serious impacts particularly on health and economic activity in many countries. The fifth top risk for global deaths is overweight and obesity, with approximately 2.8 million adults dying each year as the result of these conditions (1). As an example of obesity's economic impact, in the United States, the medical care costs of obesity were approximately \$147 billion in 2008 (18).

Health consequences

Overweight and obesity contribute to the risk for burden of diseases, such as diabetes (44% of obese patients are diabetic), ischaemic heart disease (23%) and certain cancers (7-41%) (1). In the UK, the risk of hypertension is increased up to fivefold in people with obesity; CHD risk increased twofold in adults under 50 years of age and 10% of all cancer deaths in non-smokers are associated with obesity. Moreover, around 8.7% of total deaths in the UK are estimated to be as a result of excess weight (16). In children, obesity increases the risks of

fractures and health problems (e.g. hypertension, early markers of cardiovascular disease and insulin resistance). It is also associated with a higher risk of remaining obese, developing disability and having premature death as an adult (58).

Economic costs

For health care providers and policy-makers, the most significant issues were the economic costs of overweight and obesity, including direct costs, opportunity costs and indirect costs. Direct cost refers to costs associated with obesity treatment incurred by the individual and the service provider, while opportunity cost is social and personal loss associated with obesity (related to premature death and associated morbidity). Absenteeism from work and premature death result in reduced productivity and are classified as indirect costs to organisations. The economic costs of obesity were reported high in many developed countries. The economic impact of obesity in developing countries had not been evaluated. However, the increasing economic burden of adult non-communicable diseases (NCDs) was noted in some countries (derived from funds spent on expensive equipment, drugs and specialised training for staff) (19, 20). A study done in Australia highlighted the estimated direct costs of obesity (BMI >30) was A\$464 million from year 1989 to 1990, the amount contributed to more than 2% of the National Health Care costs (59). While, in USA the estimated direct costs of obesity (BMI >29) was US\$45,800 million and it contributed to 6.8 % of the National Health care costs (60)

2.6. Public health interventions for obesity

The main principle of public health action is promoting and protecting the health of the population using an integrated approach, including environmental, educational, economic, technical and legislative measures and the early detection and management of diseases through the orientation of the health care system. The two types of public health intervention strategies generally used to tackle obesity are improving the knowledge and skills of individuals in a community, and reducing the exposure of populations to the underlying environmental causes of obesity (19, 20). Swinburn et al., highlighted specific strategies to

reduce obesity prevalence including: controlling the food supply to make healthy choices easier; reduce the marketing of energy-dense foods and beverages to children; promote PA by influencing urban environments and transport systems; developing community-wide programmes in multiple settings; increased communications about healthy eating and PA; improved health services to promote breastfeeding; and management of overweight or obese people (6).

While, the key finding of a review (that included 23 systematic reviews and meta-analysis as well as 22 action plans and expert panel reports) showed little direct evidence on the efficacy of public health interventions for obesity, and the current evidence was weak with few interventions had proved to be effective. Breastfeeding intervention produced very modest reductions in childhood obesity, whereas among adults using pharmaceutical or behavioural methods produced modest effects. Bariatric surgery produced substantial effects (61). The method used in the review had various limitations including ‘PICO’ (refers to participant, intervention, comparison and outcomes) criteria and measurement effects methods for meta-analysis review were not assessed for each article included. The assessment on quality of included studies was not reported. The key findings may not be accurate and were subjected to bias.

Improving the knowledge and skills of individuals in a community

One of the most common strategies used in public health interventions to control obesity is to improve the knowledge and skills of individuals in a community via the mass media, workplace interventions, school-based programmes and curricula, as well as skills training in a network of clubs and community centres. The aims of these methods were to reach a wide audience, provide information and promote behaviour change (19, 20). A review was done to investigate the effectiveness of obesity related lifestyle interventions in 26 studies (using PA or healthy diet) by social economic status (SES) in Netherland showed that seven lifestyle interventions were found more effective and four less effective in groups with high SES, while 15 studies produced no differential effects. One study in the healthcare setting reported equal effects in both socioeconomic groups. The mass media campaign presented modest

evidence for higher effectiveness among those with high SES. Individually tailored and workplace interventions showed to be more effective in higher-SES groups in four studies, while there was no difference in effects reported in 9 studies. Seven studies using school-based studies showed mixed results. Two community studies had provided evidence for better effectiveness in lower-SES groups but none in higher-SES groups. While, one study using community-based intervention showed effectiveness in low-SES groups (21) The major limitations of the review were ‘PICO’ (refers to participant, intervention, comparison and outcomes), data extraction by two reviewers and quality assessment tool to identify bias were not reported in the method. There was not clear evidence on the effectiveness of lifestyle interventions to obesity.

Reducing population exposure to an obesity-promoting environment

Potentially the most effective strategy to deal with obesity in the population is to tackle the environmental and societal factors that induce the obesity-promoting behaviour of individuals within a population. It may be possible to reduce the exposure of the whole population to social factors that promote obesity, e.g. high-fat foods consumption and a sedentary lifestyle (19, 20).

Increasing physical activity

The two main interventions in preventing the development of obesity are increasing levels of PA and improving the quality of diet, both of which are often determined by the economic situation of a population. The interventions to increase PA need to be planned as long-term interventions that change the environments that promote or maintain supplementary daily and low-intensity recreational activities to make it more achievable, instead of just sporadic. Activities that can be conveniently incorporated into daily life include: walking in pedestrian areas, gardening, dancing, cycling, home improvement and swimming. PA must be presented as enjoyable and convenient activities that may persuade individuals to eventually become less sedentary and regularly participate in exercise (19, 20).

A large systematic review of 41 randomised controlled trials (RCTs) (from the United States of America, Netherlands, Canada, Australia and the UK, with a total of 3,476 participants) demonstrated that exercise has a positive effect on body weight amongst overweight or obese individuals. Exercise alone resulted in small weight loss compared with no treatment. Exercise combined with diet leads to a greater weight reduction than diet alone, and increasing exercise intensity increased the magnitude of weight loss further. Exercise is associated with improved cardiovascular disease risk factors such as serum lipids, blood pressure (BP) and fasting plasma glucose, even if no weight is lost. Higher intensity exercise resulted in greater reduction in fasting serum glucose than lower intensity exercise. The trials included were conducted before 2006 and the duration of the trials ranged from 3 to 12 months including follow up (23) The major limitation of this review is the paucity of long-term trials available for inclusion in the analyses. The trials included were conducted before 2006 and the duration of the trials ranged from 3 to 12 months including follow up.

Improving the quality of the diet

It is important to improve the quality of diet in parallel with increasing PA in controlling obesity, but there are challenges confronting individuals, such as maintaining dietary energy density and nutrient-energy ratios, inadequate energy consumption and overconsumption of energy-dense diets. In adults, energy deficiency is less likely to happen because of the bulkiness of their food. The problem is overconsumption of energy-dense diets rich in fat and highly refined products that are low in fibre, which promotes overconsumption and weight gain, especially amongst individuals who are not physically active (19, 20). Conversely, a systematic review of 18 RCTs (with a total of 1,467 participants) included using dietary intervention found no evidence on the efficacy of the diet intervention alone. The dietary interventions were low-fat/high-carbohydrate, low-calorie (1000 kcal per day) and very-low-calorie (500 kcal per day) and modified fat diets. However, dietary advice plus exercise was associated with a statistically significant mean decrease in the glycated haemoglobin of 0.9% (with 95% CIs of 0.4 to 1.3) at 6 months and 0.1% (with 95% CI of 0.4 to 1.5) at 12 months in people with type 2 diabetes. Therefore, there was limited evidence on the effects of low-fat or other weight reducing diets (62). The methods and quality assessment conducted was well reported in the review and the quality of the results can be considered high. Nevertheless the

heterogeneity test using fixed effects model for continuous data only done on 3 outcomes and not specific details was stated.

Likewise, a key finding from a large systematic review of 44 clinical trials included (with a total of 19 273 obese adults) showed that dietary/lifestyle therapy provides less than 5 kg weight loss after 2-3 years, while drug therapy provides 5-10 kg weight loss after 1-2 years, and surgical therapy provides 25-75 kg weight loss after 2-4 years. In another words, dietary/lifestyle produced minimum weight loss compare to drug and surgical interventions at least after 2 years (25). The flaws of the review include the protocol used, and also the quality assessment tool for the included studies was not reported. Therefore, the quality of the results presented may be subject to biases such as reporting and selection bias. The methodological limitation of the review had restricted the applicability of findings to obese patients in other settings.

Some studies had reported that interventions based on both dietary and exercise resulted in significant weight loss among obese adults (27, 30, 63, 64). An earlier review of 493 studies to determine effect of diet, exercise, and diet plus exercise interventions for weight loss in obesity showed significant weight loss in the given interventions: diet (10.7 kg, s.e. 0.5), exercise (2.9 kg, s.e. 0.4) and diet plus exercise (11.0 kg, s.e. 0.6) in short duration of time. A 15-week diet or diet plus exercise programme produced a weight loss of approximately 11kg (with 6.6 s.e. 0.5 and 8.6 kg s.e. 0.8 kg) which was maintained after one year (30). The review has major flaws including the fact that the protocol used was not stated, the method of data extraction and analysis performed by two reviewers were not mentioned, and no quality assessment was conducted. It was subject to poor validity of methods and low quality of results due to potential biases (such as selection and reporting) that may be present in each included study. Similarly, a systematic review found dietary and exercise treatments for adult obesity produced moderate weight loss (about 3-5kg) compared with no treatment or usual care. Meanwhile, weight loss from drugs used in conjunction with diet or exercise programmes also produced 3-5 kg of weight loss, but the effects only lasted until the drug was stopped. The reported weight lost can be statistically significant, but it may not be sufficiently clinically significant to improve patients' health or quality of life (27). The

limitations of the review include protocol used was not reported which there was no clear explanation provided on the participant, intervention, comparison and outcomes measured. In addition, data extraction and analysis methods done by two reviewers were not mentioned and this may raise issue on the validity of the method.

Another Cochrane review of 23 RCTs on the effects of pharmacological and non-pharmacological (diet and exercise) strategies for preventing weight gain in people with schizophrenia reported short-term significant mean weight change at the end of treatment (WMD -3.38kg, CI -4.2 to -2.0) in two cognitive/behavioural trials, whereas for pharmacological adjunct treatments there was modest prevention of weight gain (WMD -1.16kg CI -1.9 to -0.4, 6 RCTs, n=274). For weight loss, the review found greater weight reduction in the cognitive behavioural intervention group (WMD -1.69kg CI -2.8 to -0.6, 3 RCTs, n=129) compared with standard care. However, there was insufficient evidence to support the general use of pharmacological interventions for weight management of the studied group (63) The review had a well design methods and conducted quality assessment, thus the quality of the results can be considered high. The main limitations of the review were participants were not well defined and used of QUOROM tool was not reported.

A recent review of 8 RCTs (and a total of 5,956 participants) reported that exercise plus diet interventions reduced the risk of diabetes compared with standard recommendations (RR 0.63, 95% CI 0.49 to 0.79). The intervention had favourable effects on weight and BMI reduction, waist-to-hip ratio and WC and BP. There was a reduction in the incidence of diabetes of 37% with exercise and diet combination intervention, while no statistically significant effects on diabetes incidence were observed when comparing exercise-only interventions either with standard recommendations or with diet only interventions (64). The major limitation of this review were publication and small study bias and it could not be assessed at present due to the insufficient amount of data

Behaviour modification

Behaviour modification is one of the recommended interventions in obesity management at a community level that focuses on changing and improving an individual's eating habits and levels of PA. It is a critical element in the prevention and treatment of obesity (19, 20, 65). According to the Foresight Report UK 2010, there is a need to change the environment, organisational behaviour and individual behaviour (including group and family) in preventing obesity. Similarly, the public health approaches must focus on implementing strategies that maintain behavioural change and habits to deliver gains for the individual and the population. The core component of any intervention is behaviour change particularly for individuals as it goes beyond education and the provision of information. It is often difficult to achieve change because it is resource intensive and time consuming (3).

In this study, 'BCMs can be defined as models that attempt to explain the basis, motivational mechanisms and processes of alterations or modification of individuals' behavioural patterns. The models or theories suggest that environmental, personal and behavioural characteristics are the major factors in determining adaptation of a new behaviour, and each theory or model focuses on different factors in attempting to explain the behavioural change (66, 67).

Many studies used BCM as theoretical frameworks for dietary and PA interventions in the prevention and management of obesity for weight loss amongst overweight and obese adults. The most widely used BCMs were self-efficacy theory (SET), social cognitive theory (SCT), the theory of reasoned action (TRA) and theory of planned behaviour (TPB) and the TTM SOC (68). Studies had shown that common behaviour modification models used in the prevention and management of obesity include SET (69-72), SCT (73-75), TRA and TPB (76-79) and TTM SOC (80-83).

Only one review published to date had assessed the use of behavioural interventions for preventing and treating obesity in the adult population – it reported that the majority of the interventions were not based on any explicit behavioural theory. There were ten studies used a theory and the most common theories were SCT (3 studies), TTM (3 studies) and social

marketing theory (2 studies), while others were cognitive behavioural approach, TPB, social support, construct of goal setting and construct of outcome expectations. The duration of the interventions ranged from 3 weeks to 9 years, and the methods used to deliver the programmes were group sessions and media. The interventions were mainly implemented in patient care or hospital settings, since there have been fewer interventions in community and worksite settings. BMI was the most common determinant to measure impact of the interventions. There were fifteen interventions showing positive change in adiposity indices, while six indicated no change in adiposity indices (24). The review had several limitations that include PICO (participant, intervention, comparison and outcomes) was not clearly described, data extraction by 2 reviewers were not reported, protocol was not used and no quality assessment was indicated. Therefore, the methods used were not rigorous and the included studies may be subjected to biases

Self-efficacy theory

The self-efficacy theory proposes that an individual's confidence to perform a required behaviour in producing outcomes is most often an estimation of an individual's personal ability to do something and often determines how successful a person is in changing one's behaviour and consequently maintaining the change (84). The two key elements of the theory are individual's confidence in coping with high risk situations and avoiding relapse in the 'bad' behaviour (85-87). Few studies using SET with diet and PA intervention were shown to be effective in generating weight loss among adults. A RCT study using SET as theoretical framework with dietary intervention in 170 obese participants reported significant adherence ($p=0.04$) in reducing amount of fat consumption in diet and such behaviour was associated with weight loss particularly at 18 months ($p = 0.02$) (88). The study had a small sample size therefore the results cannot be generalized to other population. The selection of sample, randomization and blinding methods were not clearly reported thus there were potential of biases in the study

Similarly, another RCT study using SET in combination with PA and dietary interventions to predict weight change among showed significant improvement on measures of exercise, self-efficacy, body satisfaction, and mean weight loss over 20 weeks amongst White (n=34) and African American (n=30) women who were obese (89). The main limitation of the above studies was small sample size that might affect the generalizability of the finding to other setting, and furthermore the sample selection and randomization methods were not clearly stated that might resulted in selection bias.

Social cognitive theory

The social learning theory (SLT) is the original blueprint of social cognitive theory (SCT) and its main principle is that an individual learned about behaviour by observing others (i.e. vicarious learning). SCT refers human behaviour as a dynamic that requires simultaneous influence of environment and the person. It describes an individual's behaviour change as a result of continuous interaction among the characteristics (personality) of a person, the behaviour and the environment within which the behaviour is performed (reciprocal determinism). The theory suggests that an individual learned (cognition process) about behaviour from other people through observation and receiving reinforcements. Therefore, the three main factors influencing an individual's development are the environment, behaviour, and cognition that tend to reciprocate each other. The major concepts of SCT are environment, situation, behavioural capability, expectations, expectancies, self-control, observational learning, reinforcements, self-efficacy, emotional coping responses and reciprocal determinism, which are explained in detail in '**Appendix 1**, 'Major concepts in social cognitive theory and implications for intervention' (66, 84). SCT was used as theoretical framework for dietary and PA interventions and resulted in significant decreases in mean body weight in two trials (from 1.10 kg to 5.20kg) at 3 months (78) and 18 months (90). The main limitations of the trials were the short duration of the intervention to show weight loss maintenance, and there was too small a sample size to show significant impact of outcome in the studies.

Theories of reasoned action and planned behaviour

The TRA and TPB focus on theoretical constructs concerned with individual's motivational factors which determine the likelihood of an individual performing a specific behaviour. The TRA explains the relationship between an individual's social belief (behavioural and normative) and attitudes that determine a person's behavioural intention to perform a specific behaviour. The main assumption of the theory is behaviour occurs in a causal chain of processes and the sequences of the main constructs are behavioural beliefs, normative beliefs, attitude, subjective norms and behavioural intention. The constructs were depicted in **'Appendix 2'**, 'The constructs and definition of TRA and TPB. The main assumption is that individuals often consider the consequences of a particular behaviour before performing it. Therefore, the individual's intention is an important factor in determining behaviour and behavioural change that develops from an individual's perception of behaviour, either as positive or negative, and also the individual's impression of societal perception of the behaviour. The two main elements that shaped 'intention' are personal attitude and social pressure shape that result in individual taking up the behaviour and changing the behaviour (66, 91).

The TPB evolved from TRA that focuses on 'perceived behaviour control' that considers factors outside the individual's control that is affecting an individual's intention and behaviour. The key assumption is that behavioural performance determined by both motivation (intention) and ability (behavioural control). The concept of 'perceived behavioural control' is determined by the individual's 'control beliefs' concerning the presence or absence of resources for and against performing a particular behaviour. It is often influenced by an individual's 'perceived power' or impact of outside resources and their propensity to facilitate or inhibit the behaviour (66).

Studies have reported inconsistent findings on the effectiveness of TRA and TPB used as theoretical framework for intervention to produce significant changes in diet and PA outcomes. A large study (of 538 participants) applying TRA as a theoretical assessment framework to measure nutritional outcomes reported a significant positive correlation on

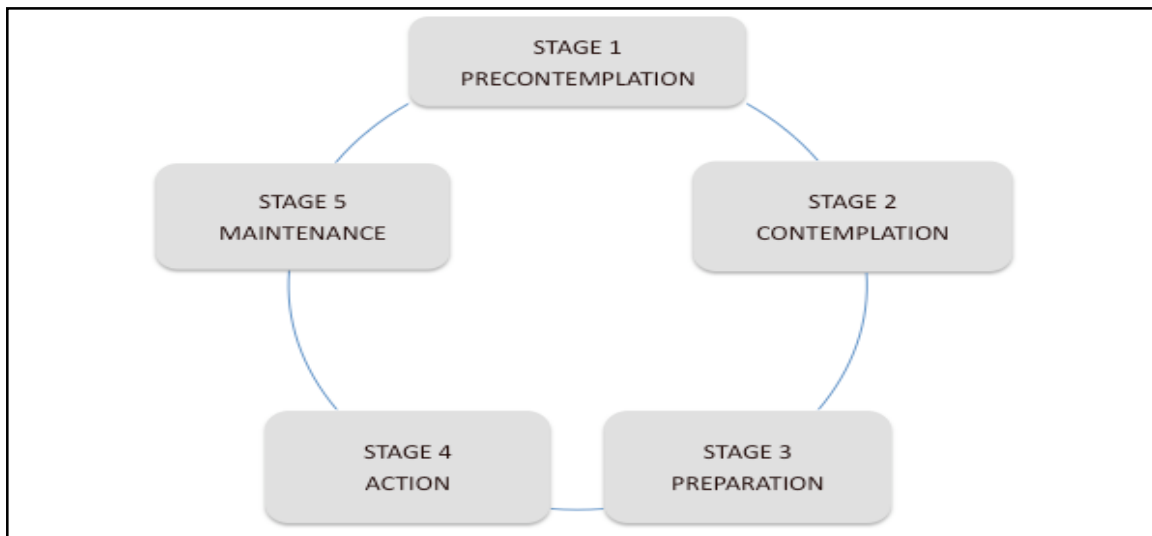
dietary outcomes (including reduced fat intake, $p < 0.001$ and improved nutrition knowledge, $p < 0.05$) amongst adults (76). Similarly, a small study ($n=96$) applying TPB to predict PA amongst obese individuals reported positive changes in PA (77). In contrast, a study ($n=139$) applied TPB to assess eating behaviour amongst youth did not show significant association between intervention and healthy eating behaviour (79). However, there were some limitations identified in the studies, including: less rigorous design used, small sample size and potential risk of bias (particularly from recall bias).

Transtheoretical model stages of change

Many studies had shown that TTM SOC was common intervention used in obesity prevention and management programmes at various settings such as clinical, community and primary care. TTM is described as the sequential behaviour change in an individual from unhealthy behaviour to a healthy one. It is a model of intentional change predicting the possible outcomes during the adaptation process of the 'new' acquired behaviour (92). The theoretical constructs of TTM are SOC, process of change and self-efficacy.

The SOC is the main construct of the TTM, which illustrates the sequential progress and series of stages that individuals will progress through for a specific behaviour transformation (92). The series of five SOC are: pre-contemplation, contemplation, preparation, action and maintenance. An individual will go through these stages in adopting a healthy behaviour or quitting an unhealthy one (66, 91, 93) and these are depicted in '**Figure 1**', 'Stages of change model'.

Figure 1: Stages of Change Model



While, the process of change describes how change occurs and can be divided into cognitive and behavioural processes. It comprises conscious raising, dramatic relief or emotional arousal, environmental re-evaluation, stimulus control, helping relationships, counter conditioning, reinforcement management and self-liberation. These are explained in detail in ‘**Appendix 3**’, ‘The characteristics of process of change’. Self-efficacy refers to individual estimation of one’s personal ability to do something and it plays a major role in how successful people are in changing their behaviour and maintaining the change where the individual has confidence in coping with situations as there is a high risk of relapse (67, 86, 94, 95)

Integration of stages of change into the process of change

The processes of change facilitate the movement of an individual through the SOC in adapting to the ‘new behaviour’. There are different processes that take place during each SOC, as shown in ‘**Table 1**’, ‘Interaction between stages of change and process of change’.

Table 1: Interaction between stages of change and process of change

Stages of Change	Process of Change
From pre-contemplation to contemplation	Consciousness raising, Dramatic relief, environmental re-evaluation, social liberation and counter conditioning
From contemplation to preparation	Helping relationships, self-evaluation, social liberation and dramatic relief
From preparation to action	Self-liberation
Maintenance	Counter conditioning, helping relationships, reinforcement management and stimulus control

When the individual moves from pre-contemplation to the contemplation stage, the processes the person tends to go through are: ‘consciousness raising’, ‘dramatic relief’ and ‘environmental re-evaluation’ (93), as well as ‘social liberation’. There is an increase in awareness and realisation within an individual about the ‘problem behaviour’ during this process. The individual seems to be interested in talking about the ‘bad behaviour’ and evaluates the effects of the behaviour to others in the environment. Next, an individual moves along the sequence of process of change specifically ‘helping relationships’, ‘self-evaluation’, ‘social liberation’ and ‘dramatic relief’ as the behaviour shifts from the contemplation to the preparation stage. The processes enable individuals to communicate with peers and ventilate feelings about the intention to change the ‘bad behaviour’. At this point, the individual is re-examining the effects of the ‘bad behaviour’ to oneself and evaluates the types of support available in the individual’s social environments. ‘Self-liberation’ is the most crucial process for individuals to embark upon from the preparation to the action stage. It is a process whereby an individual is ready to act on changing the ‘bad behaviour’ to a healthy one and ultimately requires an individual’s strong commitment to change. In the maintenance stage, the processes of ‘counter conditioning’, ‘helping relationships’, ‘reinforcement management’ and ‘stimulus control’ often occurs within the individual. The person is able to sustain the ‘new behaviour’ with support from peers, and avoid triggers for the ‘problem behaviour’ (which may cause relapse) and be rewarded for changing the behaviour (67, 94).

Few studies had shown that TTM SOC used with diet and PA as intervention produced significant weight loss and changes in diet and PA level, both in short (82) and long term studies (80, 81, 83). For example, a RCT with 34 participants using TTM SOC with diet education and PA advice as intervention showed increased in PA levels ($p \leq 0.01$) in intervention group at 6 weeks (82). The main limitations of the study were the sample size was small and attrition rate was not reported. There was no explanation given on sampling and blinding methods, therefore the study was subjected to biases such as performance, detection and attrition. Similarly, another RCT with 144 participants using TTM SOC with diet education, PA and behavioural counseling as intervention showed moderate mean weight loss (5.6kg, 6.1%) at 6 months following the 6 month clinical intervention and 3.4 kg (3.7%) and 2.7 kg (3%) at the 12 month and 24 month follow-up (81). The main limitations of the study were the sample size was small and attrition rate was not reported. There was no explanation given on sampling and blinding methods, therefore the study was subjected to selection and allocation bias.

While, a large RCT with 665 participants using TTM SOC with diet, PA and monetary reward as intervention showed early mean weight loss greater in intervention versus control groups, 0.5kg (SE=0.4kg) at 6 and 12 months. At 24 months, there was higher mean weight loss (-0.39kg, SE=0.38kg, 95% CI -1.1 to 0.4) in intervention group compared to control group (-0.16kg, SE=0.42kg, 95% CI -1.0 to 0.9) (80). The study has high quality methods and the possible limitations were that the outcome data was not clearly reported and that the results were subject to attrition bias. Another RCT among overweight or obese adults (1277 participants with a BMI 25 to 39.9) claimed that TMM-based tailored feedback can improve healthy eating, exercise, emotional distress management, and weight of the population. The results showed a significant increase in fruit and vegetable intake and individuals tended to progress to action and maintenance at 24 months (83). The study had few limitations including protocol used, sampling sequence generation and blinding was not reported. The study was subjected to biases such as performance, detection and reporting.

‘Upstream’ interventions

The ‘upstream’ interventions were considered as potential strategies for public health actions in controlling overweight and obesity in populations (20, 26, 65, 96), and were highlighted in many reports. According to WHO, multi-sectoral approaches, public and private partnerships and effective coordination of government policies (such as the development of national dietary guidelines, importation, pricing) were amongst the suggested interventions in promoting healthy diets and active lifestyles in the prevention and management of overweight and obesity in populations (20). Similarly, evidence from the UK highlighted that the prevention of obesity and overweight in both children and adults requires ‘upstream’ interventions, such as policies and strategies at a national or regional level focusing on population and environmental rather than individual interventions (96).

There was arguably lack of evidence showing the effectiveness of ‘upstream interventions’ to prevent obesity and overweight among children and adults. A policy actions review done to evaluate nutrition actions plans in the European Union (EU) members states showed that only six of the 15 members states (namely Sweden, Finland, Denmark, France, The Netherlands and the UK) had operational nutrition policy which generally seemed to comply with key recommendation in the WHO ‘Food and Nutrition Policy’ and ‘Global Strategy on Diet, PA and Health’. There were large variations within policy actions indicated between the member states in terms of terminology, nutritional recommendations, institutional framework, nutritional scope, social groups targeted and monitoring and evaluation structures. Therefore, proper evaluation and documentation of interventions in public health and nutrition policies must be considered for the existing policy action plans (97). While, another review (of 11 articles) showed lack of evidence on the impact of policies, programmes and other interventions to stimulate healthy eating and PA for obesity (36). Both studies had methodological issues (such as use of review protocol and quality assessment were not clearly reported) and these may affect the findings presented.

The NICE guidelines recommended that public health strategies can be divided into key audiences and settings (including the public, the NHS, local authorities and partners in the community, early years settings, schools, workplaces, and self-help, commercial and community programmes) and suggested various strategies for each setting. The evidence on

the effectiveness of the given public health strategies were debatable. For instance, the recommended policy actions in promoting well-being by preventing and managing obesity at the community level may include: setting priorities for action (at both strategic and delivery levels), developing health policies for employees; and planning and engagement with local community (39).

Meanwhile, at a school level the recommended key strategies by NICE guidelines were: setting priorities for action; assessment of the whole school environment based on school policies and standards (for healthy weight, healthy diet and PA); and provide training to staff on implementing healthy school policies (39). In contrast, evidence from policies review showed weak evidence on effectiveness of policy, guidelines and action plans guiding public health interventions for obesity. The policy actions must focus on increasing education on diet and PA, limiting advertisements of unhealthy food to children and adolescents, limiting access to unhealthy foods in schools, levying a tax on foods of low nutritional value, and promoting PA in schools and worksites (61). The review had few methodological flaws such as search strategy, inclusion criteria and quality assessment were not clearly explained.

Whereas, a study conducted in Canada to assess the impact of economic policies targeting obesity and its causal behaviours (diet, PA) showed weight outcomes are responsive to food and beverages prices, therefore the policy makers must address practical issues in designing policies on the use of food taxes and subsidies to address obesity. One of the key steps when implementing the economic interventions was formulation and implementation of effective health filter used to review new and current agricultural policies in order to reduce those policies that have an adverse impact on population rates of obesity. Consequently, taxation on a caloric sweetened beverage can be imposed and followed by fruit and vegetable subsidies targeted at children and low-income households. There were very few studies that had examined the impact of economic instruments to promote PA therefore policy recommendation were inconclusive (22). The study had several limitations including use of review protocol, inclusion criteria and quality assessment were not clearly reported.

Meanwhile, another review on promoting inter-sectoral collaboration and the development of integrated health policies reported that interventions for the prevention of childhood obesity can be categorised into education, persuasion, incentivization, coercion, training, restriction, environmental restructuring, modeling, and enablement. (98). The main limitation of the review was methods such as inclusion criteria had not been clearly stated

A small study on PA and healthy eating policy action among local governments in Victoria Australia highlighted nine potential areas for policy intervention at local government level, including walking environmental and food policy. The methods used were semi-structured interviews conducted with 11 key informants from local government. In addition, this study found support for policy intervention to create environments supportive of PA and little support for policy changes to promote healthy eating. The key reasons reported by participants were lack of relevance and competing priorities as reasons for not supporting particular interventions. Regulatory change and suitable funding were required for local governments to have a role in the promotion of healthy food environments.(99). This study has small sample size that might affect the findings and introduces bias

Summary of literature review

In a nutshell, BMI is a widely used measure for obesity at population level, nevertheless studies had shown that WHtR is the most superior measure of centralized obesity over BMI (50) and also for detecting cardiovascular risk factors in adults (44). Studies reported that the development of obesity may be linked to biological and genetic predispositions, for example abnormalities in the leptin and ghrelin systems and polymorphism of specific gene (10, 54). It is important to understand the underlying causes of obesity when designing public health interventions. Diet in combination with PA interventions were reported as effective public health interventions for obesity prevention and management and the interventions were widely implemented at public health (such as workplace, schools and community) (21) and other settings (patient care) (24). Both interventions resulted in modest weight loss (2 to 5kgs) after 1 to 2 years of intervention as reported in four studies (25, 27, 63, 64), whereas two studies (23, 30) had shown a significant weight loss in shorter duration of intervention

(>1 year). The interventions also had positive impact on other outcomes including improved cardiovascular disease risk factors (serum lipids, BP and fasting plasma glucose) at 12 months (23); and significant mean decrease in the glycated haemoglobin at 6 months and 12 months in people with type 2 diabetes (62). There were methodological issues that affect the results of those studies, such as used of protocol and quality assessment not stated (30), and a lack of long-term trials (23), while only a study had a well design method and the results can be considered high (63).

Meanwhile, BCM used in combination with diet and PA as interventions for obesity were shown to be effective in generating weight loss in many studies (89), while two studies reported significant decreases in mean body weight (from 1.10 kg to 5.20kg) at 3 months (78) and 18 months (90); and other outcomes (such as reduction in fat intake and increased fruits and vegetables consumption) among adults . The most widely used BCM was TTM SOC in combination with diet and PA as interventions for obesity and often implemented at clinical and public health settings (24), and the interventions produced minimal mean weight loss (between 0.5kg-5.6kg) at 6 and 12 months in three studies (80, 81, 83), while higher mean weight loss was reported at 24 months in one study (81). However, there was inconclusive evidence on sustainable weight loss after 1 year.

Policy actions were reported as useful public health intervention in the prevention and management of obesity (20, 26, 39, 65, 96). Conversely, two studies (36, 97) reported lack of evidence on the effectiveness of health policy or actions in guiding public health intervention for obesity. The contributing factors may include large variation within policy action implemented for public health and nutrition policies (97), weight outcomes were responsive to food and beverages prices (22) and competing priorities (for instance implementing policy actions in creating environments supportive of PA over promoting healthy eating). The recommended policy actions in prevention and management of obesity include: promoting healthy diet and PA level (through education at schools and worksites); taxation on food of low nutritional value (22, 61); subsidising fruits and vegetable for children and low-income households (22); regulatory change; and suitable funding (99).

3.0. Transtheoretical model stages of change for dietary and physical exercise modification in weight loss management for overweight and obese adults

3.1. Background

In the previous chapter, studies had shown that diet in combination with PA produced sustainable weight loss among obese adults at least 1 year of interventions (23, 25, 27, 62). In particular, TTM SOC used in combination with diet and PA had resulted in minimal mean weight loss (between 0.5kg-5.6kg) at 6 and 12 months (80, 81, 83), and higher mean weight loss was reported at 24 months (81). TTM SOC had shown to be effective as a theoretical and pragmatic ('real life tested') framework for lifestyle modification (with diet and physical exercise) resulting in weight loss among adults. Also, it was commonly used with diet and PA as interventions at clinical and public health settings.

TTM had proven successful as an interventional approach in smoking reduction amongst adults (92). However, the effectiveness of TTM for weight loss beyond one year was inconsistent in some studies (83, 100-105). For instance, one study found that the TTM algorithm was insensitive and most individuals failed to meet the behavioural criteria of the model stages (101), while other studies did identify stage of change for the uptake of a low-fat diet in adults (106-109). There was only one review published to date which reported that it was difficult to apply the model to look at dietary change because most studies differed in terms of the aspect of diet being examined, as well as the staging algorithms and dietary assessment methodology used. Therefore, there were significant differences in methodology that led to variable results and made it difficult to interpret the results of those studies (110). Studies had shown gaps in the literature on the effectiveness of TTM SOC (used with diet and PA) and it was widely implemented interventions for obesity prevention and management. Thus, there was a need to do a high-quality systematic review on the application of the TTM SOC model in dietary modification and assess the strength of the evidence.

Therefore, the main purpose of this systematic review was to collate evidence and allow rigorous appraisal on how and to what extent TTM works for lifestyle modification (with diet and physical exercise) producing weight loss among overweight and obese adults. The objectives of the review were to assess the effectiveness of dietary and PA interventions based on SOC to produce sustainable weight loss in overweight and obese adults. The outcomes of this review were relevant for patients and practitioners trying to understand strategies and treatment regimes for overweight and obese people at the hospital and primary care (or community) settings. The findings of this review were also useful for planning and implementing obesity management programmes as well as for policy makers.

This work was published at The Cochrane Library 2011, Issue 10 and the title is ‘TTM for dietary and physical exercise modification in weight loss management for overweight and obese adult’.

Description of intervention

In this review, the SOC was defined as a paradigm represents a sequential facet and assumes that individuals will go through a series of five stages (pre-contemplation, contemplation, preparation, action and maintenance) in adopting healthy behaviour or quitting unhealthy behaviour. The ‘pre-contemplation’ defined as the stage in which an individual has no intent to change behaviour in the near future, usually measured as the next six months. Individuals at this stage may be not be informed or lack information about the consequences of their behaviour, or have attempted to change their behaviour and failed, and may therefore be demoralised about their ability to change their behaviour. These people are often characterised as resistant or unmotivated and tend to avoid information, discussion, or thought with regard to the targeted health behaviour (66, 91, 93).

The 'contemplation' stage referred to where individuals openly state their intent to change within the next six months. The individuals have increased awareness of the benefits of changing but are still considering the cost involved in changing their behaviour. These people are seriously undecided to change and are stuck at this stage for a longer period of time. They are also known as contemplators or procrastinators and are often not ready for traditional action-oriented programmes (66, 91, 93).

In the 'preparation stage' the person intends to take steps to change, usually occurring within the next few months. These individuals have attempted some important action in the past and most often have a plan of action, for example attending health education (HE) classes and talking to the counsellor. These are the people who should be recruited for action-oriented programmes. However, the individuals that have not met the criteria for effective action and can be considered as at the early stirrings of the action stage (66, 91, 93).

The 'action stage' was stated as when people have made overt modifications in their lifestyles within the past six months. Individuals must meet the criterion agreed by professionals to reduce the risk of a disease, for example a successful change of addictive behaviour means achieving a specific criterion, such as abstinence (66, 91, 93)

In the 'maintenance' stage, individuals work to avoid relapse and are less inclined to deteriorate as they increasingly become confident and able to continue their changes. Conventionally, maintenance was viewed as a static stage but it is actually a continuation and not merely an absence of change. The main characteristics of this stage are stabilising behaviour change and avoiding relapse (66, 91, 93).

In exceptional cases, the termination stage is the sixth stage which applies to some behaviours, particularly addictions such as smoking and alcohol abuse, where the individuals have no temptation and total self-efficacy. These people will not return to their old unhealthy

habit as a coping mechanism in spite of high emotional pressures, such as being depressed, lonely or stressed (66, 91, 93).

The model's two main underlying assumptions are, firstly that the majority of people are not ready to change their behaviour and will therefore not be helped by traditional action oriented prevention programmes. Secondly that behavioural change is complex and may unfold in a sequence of stages. Individuals typically adapt these different processes of change according to the progress they have made towards changing their behaviour (DiClemente C.C. et al., 1985).

As mentioned in the literature review, SOC provides a conceptual explanation of the processes that individuals undergo when modifying a problem behaviour or acquiring a positive behaviour, in this case changing dietary intake and PA in order to achieve a sustainable weight loss. The potential main adverse effect of the intervention may include relapse into unhealthy behaviour and weight gain over a specific period of time.

How the intervention might work?

The intervention might work by providing information on stage related strategies that can be applied to individuals' weight loss management programmes. The proposed strategies were intended to change both dietary and physical exercise behaviour of participants to achieve sustainable proportion of weight loss among overweight and obese adults. The hypothesis was that the TTM model truly reflects human behaviour in the process of change (DiClemente 1985). The intervention also enabled predictions on which strategies were suitable for the individuals at certain stages; therefore weight loss strategies were targeted and tailored to meet the participants' needs. Dietary strategies based on TTM SOC might work by meeting individuals' needs according to its predictions. As a result there would be a change in the dietary habits (such as reduction in daily calories and fatty food consumption) which was repeatable (as the behaviour change takes place), leading to sustainable weight

loss. Similarly, physical exercise strategies tailored according to the model possibly work by increasing the level of exercise and PA occurring at continuous and sustainable manner resulting in the targeted outcome. The significance of such an approach was the behaviour change takes place voluntarily and was highly self-driven that may contribute to sustainable desired behaviour change. TMM-based tailored feedback can improve healthy eating, exercise, emotional distress management, and weight among overweight and obese adults. Furthermore, there was a significant increase in fruits and vegetables intake and individuals tended to progress to action and maintenance at 24months (83).

However, another earlier study done on TTM SOC application found that it is difficult to apply the model looking at dietary change because most studies demonstrated differences in terms of the aspect of diet being examined, as well as the staging algorithms and dietary assessment methodology (110). TTM was a useful theoretical model in guiding interventions and predicting outcomes in dietary management among adults, as evidently shown in some studies above. The studies with rigorous design had shown statistically significant results that linked SOC with the primary measured outcomes, particularly for large sample studies with longer follow up periods. It was potentially plausible applying the TTM to other settings and may be applicable in measuring other outcomes such as physical exercise modification and weight loss. The two common primary outcomes measured in dietary modification using the TTM model as guidelines are reduction in fat consumption and increase in healthy food intake (i.e. increase in fruits and vegetables consumption) (83, 102, 111, 112).

3.2. Methods

Criteria for considering studies

The criteria for considering the studies for this review were divided into four main categories which were: types of studies, participants, intervention, and control and outcomes (PICO) as suggested by the Cochrane Handbook for Systematic Reviews of Interventions (113).

In this review, randomised, controlled clinical trials were the only type of study included. The participants proposed were adults aged 18 years and over and were overweight or obese according to any standard parameters used by the both the WHO (e.g. BMI, waist measurement, waist-to-hip-ratio) and the criteria valid in the country at the time of the start of the trial. Overweight was defined as a BMI 25 to 30, and obesity as a BMI above 30. Participants with co-morbidities, such as diabetes, heart diseases and hypertension were included in the review. The intervention was the application of the TTM SOC combined with lifestyle modification strategies, mainly dietary and physical exercise, which were tailored to an individual who was overweight or obese. The studies included must describe the intervention as use of TTM as a model, theoretical framework or guidelines in designing lifestyle modification strategies as stated above. The intervention needed to fulfil the criteria of TTM SOC including pre-contemplation, contemplation, preparation, action, maintenance and termination (93). The control was any usual advice on diet or advice on physical exercise.

The two main types of outcome measured in this review were change in dietary consumption and change in physical exercise. The first outcome was ‘change in dietary consumption’ and defined as a reduction in the daily number of calories; a reduction in fatty food intake; and an increase in daily fruit and vegetable consumption. The second outcome was ‘change in physical exercise’ and referred to increase in any form of daily PA (in terms of intensity, frequency, duration and types), non-prescribed or prescribed by health professionals. The outcomes were specifically defined in ‘**Table 2**’ ‘Primary and secondary outcomes measured in the review’.

Table 2: Primary and secondary outcomes measured in the review

Primary outcomes	<ul style="list-style-type: none"> • weight loss (measured at one month, three months or six months after intervention in the scale reference used for the trials, both absolute and relative changes are considered, including kilograms, stones and percentages) and maintained at one, two and five years. • health related quality of life (whenever applicable in each study)
Secondary outcomes	<ul style="list-style-type: none"> • self-reported change in dietary habit and measured change in dietary; • self-reported uptake in PA and measured change in PA; • change in weight loss measures (BMI, skin folds measurement, waist measurement and waist-to-hip-ratio) at three months and later after intervention; • adverse events including relapse into unhealthy behaviour, weight gain and non-compliance. • morbidity (whenever applicable in each study) • cost (whenever applicable in each study)

The potential covariates, effect modifiers and confounders were as such: underlying chronic diseases, such as cancer, diabetes, and respiratory disease that may cause weight loss; compliance; and pharmaceutical interventions. The timing of outcome measurement are at one month, three months, six months, one year and, if available, two to five years, as stated by each trial.

Search methods for identification of studies

The main search methods for identification of studies were using electronic databases and hand-searching. For the electronic search, I used the following sources for the identification of trials:

- The Cochrane Library (issue 10, 2010);
- MEDLINE (until December 2010);
- EMBASE (until January 2011);
- PSYCHINFO (until January 2011).

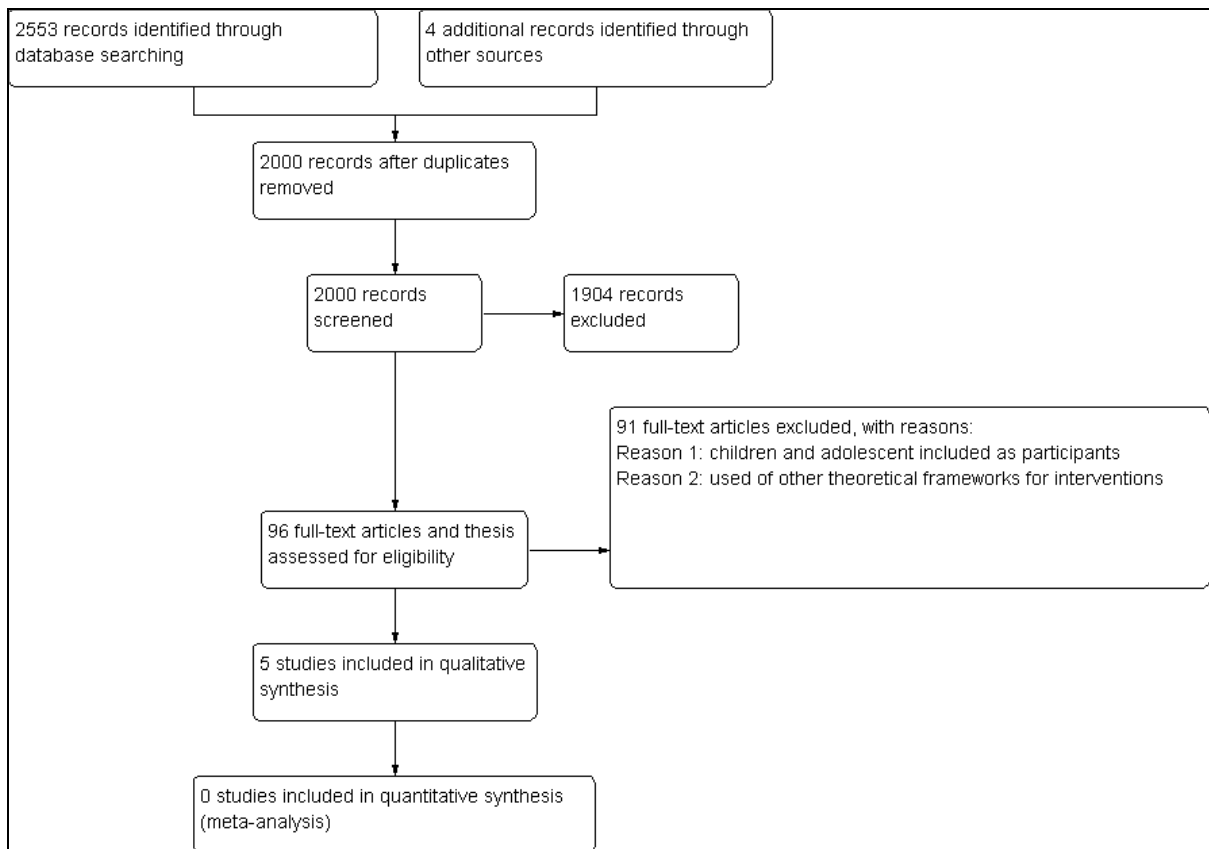
I also searched databases of ongoing trials, including current controlled trials (www.controlled-trials.com) and the National Research Register (www.update-software.com/National/nrrframe.html). The detailed search strategies were shown in the review article attached. In the case of additional key words of relevance detected during any of the electronic or other searches, the electronic search strategies had been modified to incorporate these terms. Studies published in any language were included.

I identified additional studies by searching the reference lists of included trials and (systematic) reviews, meta-analyses and health technology assessment reports noticed. Potential missing and unpublished studies were sought by contacting experts in the field. I used library resources at Imperial and at the British Library if potentially relevant articles were cited, but not available via databases or web sites.

Selection of studies

Two assessors (NT, CA) independently scanned the abstract, title or both sections of every record retrieved to determine the studies to be assessed further. All potentially relevant articles were investigated as full texts. Inter-rater agreement for selection of potentially relevant studies was measured using the kappa statistic (114) and the value obtained was 0.82, which showed the strength of agreement between assessors was very good. Differences were marked and if these studies were included later on, I planned to study the influence of the primary choice by means of a sensitivity analysis. Where differences in opinion existed, they were resolved by a third party. In the event, it was not possible to resolve disagreement the article was added to those 'awaiting assessment' and authors were contacted for clarification. The flow-chart of the study selection based on an adapted PRISMA (preferred reporting items for systematic reviews and meta-analyses) is depicted in **'Figure 2'**, 'The flow chart of the study selection' (115).

Figure 2: The flow chart of the study selection



Data extraction and management

For studies that fulfilled inclusion criteria, two assessors (NT, CA) independently extracted relevant population and intervention characteristics using standard data extraction templates (for details see ‘**Appendix 4**’, ‘Characteristics of included studies’; ‘**Appendix 5**’, ‘Characteristics of excluded studies’; ‘**Appendix 6**’, ‘The matrix of study endpoints’; ‘**Appendix 7**’, ‘Adverse events in the included studies’) and any disagreements resolved by discussion, or if required by a third party. I also sought any relevant missing information on trials from the original author(s) of the articles where necessary.

Assessment of risk bias in included studies

Two assessors (NT and CA) assessed each trial independently. Possible disagreement was being resolved by consensus, or with consultation of a third party in case of disagreement. Inter-rater agreement for key bias indicators (e.g. allocation concealment, incomplete outcome data) was calculated using the kappa statistic (114) and the value obtained was 0.72, which showed the strength of agreement between assessors was good. In cases of disagreement, the rest of the group was consulted and a judgement was made based on consensus.

I assessed the risk of bias using the Cochrane Collaboration's tool (116). I used the following criteria:

- was the allocation sequence adequately generated?
- was the allocation adequately concealed?
- was knowledge of the allocated intervention adequately prevented during the study?
- were incomplete outcome data adequately addressed?
- were reports of the study free of suggestion of selective outcome reporting?
- was the study apparently free of other problems that could put it at a high risk of bias?

A judgement of 'Yes' indicates a low risk of bias, 'No' indicates high risk of bias and 'Unclear' indicates unclear or unknown risk of bias. I used these criteria for a judgement of 'Yes', 'No' and 'Unclear' for individual bias items, as described in the Cochrane Handbook for Systematic Reviews of Interventions (116). A 'risk of bias graph' figure and a 'risk of bias summary' figure are attached. I assessed the impact of individual bias domains on study results at endpoint and study levels.

Measures of treatment effect

The measures of treatment effect were categorised as dichotomous and continuous data. Dichotomous data were expressed as odds ratios (OR) or risk ratios (RR) with 95% CIs). Continuous variables were expressed as differences in means (MD) with 95% CI.

Unit of analysis issues

I took into account the level at which randomisation occurred, such as cross-over trials, cluster-randomised trials and multiple observations for the same outcome. I attempted to assure baseline and follow up weights and heights (or other weights measures used in the trials) from the authors if not reported. For cluster-randomised and cross-over trials the focus of analysis was on the weight loss value, both absolute and relative, as defined by each study. Different units of analysis (for example OR and RR) were subjected to a sensitivity analysis.

In this review, a cluster randomised trial referred to a trial in which individuals were randomised in groups (i.e. the group is randomised, not the individual). For example, in a TTM study, the patients in one general practice may be randomised as a group to receive either TTM or the control intervention. The reasons for performing cluster randomised trials vary, for instance sometimes the intervention can only be administered to the group; and on occasion the design can be simply more convenient or economical. The simple approach used when dealing with cluster randomised trials was to assess outcomes only at the level of the group, thereby keeping the unit of analysis the same as the unit of randomisation. However, there were several limitations to this approach. First, cluster randomised trials are likely to randomise fewer groups. So, I would end up with less data (and hence less statistical power) than a simple trial involving substantially fewer participants analysed as individuals. Second, not all groups will be the same size, and I would give the same weight to clusters of different sizes. In these cases, an alternative approach planned was to ignore the groupings and compare all the individuals in intervention groups with all those in control groups. This has been a common approach both to analysing individual cluster randomised trials and to representing them in systematic reviews. But it can be problematic because it ignores the fact that individuals within a particular group tend to be more similar to each other than to members of other groups. Such analyses can spuriously overestimate the significance of differences and should be avoided. Where possible, therefore, I used statistical techniques for appropriate analyses of cluster randomised trials, if relevant. I recognised that clusters were made up of individuals and that there may be more individuals in one cluster than in another. The intra-cluster correlation coefficient plays an important role in these techniques (117)

In a cross-over trial, I planned randomising participants to a sequence of treatments and analysis of data from cross-over trials should exploit the fact that each patient acts as his or her own control. This provides us data for each patient both when they were in the interventional group and in the control group. I would make comparison for each patient to assess the effect of TTM within each patient. This can be considered a very efficient approach to analysis, because when making the comparison between treatment and control investigators do not have to allow for all the variation that occurs between patients, which investigators have to deal with in a parallel group trial. I also intended to examine potential sources of bias in cross-over trials when necessary. For example, did the patients start the second period in a similar state to how they started the first period? I anticipated that if the characteristics of participants had changed in some way by the time the second period started, then the comparison of treatments was not fair, and there would be within-patient variation, which needed to be accounted for. Our initial searches had suggested that there were few if any cross-over trials in the area of TTM and behaviour modification with respect to obesity (117)

Dealing with missing data

I obtained relevant missing data from authors, if feasible, and carefully performed evaluation of important numerical data, such as screened, randomised patients, as well as intention-to-treat (ITT), and as-treated and per-protocol (PP) population. I investigated attrition rates, for example: drop-outs, losses to follow-up, withdrawals and critically appraised issues of missing data and imputation methods (for example, last-observation-carried-forward (LOCF)).

Assessment of heterogeneity & reporting biases

Upon assessment, there were variations in the results reported by the included studies. Therefore, it was not applicable to perform statistical assessment methods of heterogeneity using forest plots, I^2 statistic test and meta-analysis. I attempted to determine potential

reasons for heterogeneity by examining individual study and subgroup characteristics. The assessment of reporting biases using funnel plots was not applicable during the analysis because the included studies did not report adequate data on biases.

Data synthesis

Data were summarised statistically, if they were available, sufficiently similar and of sufficient quality. I would have performed statistical analyses according to the statistical guidelines referenced in the newest version of the ‘Cochrane Handbook for Systematic Reviews of Interventions’ (116).

Subgroup analysis and investigation of heterogeneity

I mainly carried out subgroup analyses if one of the primary outcome parameters demonstrated statistically significant differences between intervention groups. In any other cases, subgroup analyses were clearly marked as a hypothesis generating exercise.

The following subgroup analyses were planned:

- overweight and obese groups
- with co-morbidities and without co-morbidities groups
- age groups
- gender

Sensitivity analysis

I performed sensitivity analyses in order to explore the influence of the factors on effect size:

- repeating the analysis excluding unpublished studies;
- repeating the analysis taking account risk of bias, as specified above;
- repeating the analysis excluding very long or large studies to establish how much they dominate the results;

-
- repeating the analysis excluding studies using the following filters: diagnostic criteria, language of publication, source of funding (industry versus other), and country;

However, I was not able to test the robustness of the results by repeating the analysis using different measures of effect size (relative risk, odds ratio, etc.) and different statistical models (fixed-effect and random-effects models), because of the variations in outcomes measures reported by the included studies.

3.3. Results

Description of studies

The search strategy identified 2557 records. After review of the 2001 titles and available abstracts, 96 potentially full text articles and theses were identified for further assessment. A total of 5 studies met the inclusion criteria of the review after full text review. Please see more information in the flow chart of the study selection (**Figure 2**). The descriptions of studies are shown in the ‘Characteristics of included studies’ (**Appendix 4**) and ‘Characteristics of excluded studies’ tables (**Appendix 5**).

Included studies

The details of the included studies are described in the table ‘Characteristics of included studies’ in ‘**Appendix 4**’. There were a total of 5 studies included in the review. Two trials (80, 83) were of parallel design with one to one randomisation ratios, two trials (118, 119) did not state the randomisation ratio and one trial (120) was of factorial design. The TTM SOC was used in a variety of ways in the studies, and dietary modification and exercise were common interventions for weight loss. The trials were published between 2001 and 2007 and the study sample sizes varied from 56 to 1277 participants. The duration of included trials ranged from six weeks to 24 months.

Table 3: The overview of studies' populations

Study ID	Intervention(s) & control(s)	[n] screened	[n] randomised	[n] safety	[n] ITT	[n] finishing study	[%] of randomised participants finishing study	Comment
Dinger 2007	I: pedometer + TTM SOC C: pedometer only	I: none C: none Total: 74	I:32 C: 24 Total: 56	none	I:32 C: 24 Total: 56	I:32 C:24 Total: 56	I:57% C:43% Total:100%	Drop out (n=13), missing data (n=3) and extreme values (n=2)
Johnson 2008	I: SOC + diet, physical activities + stress management C: usual care	I:none C:none Total:4290	I:628 C: 649 Total: 1277	none	I:628 C: 649 Total: 1277	I:335 C: 426 Total: 761	I:53.7% C:66.7% Total: none	Loss of follow up (n=261), no longer eligible(n=24), refused (n=37) and dead (n=1)
Jones 2003	I1: PTC I2: PTC + blood test strips C1: usual diabetes treatment C2: usual diabetes treatment + blood test strips	I:860 C:169 Total:1029	I:260 I2: 269 C1:250 C2: 250 Total: 1029	none	I1:260 I2: 269 C1:250 C2: 250 Total: 1029	none	none	Data on drop-out, lost to follow up and missing was not reported.
Logue 2005	I:TM-CD C:augmented usual care	I:none C:none Total:665	I:329 C:336 Total: 665	none	I:329 C:336 Total:665	I: 266 C: 271 Total: 537	I:79.2% C:82.4% Total: none	Dead (n=3) with non-study related cause, missing data (12%) and loss to follow up was not accounted.
Stepstone 2001	I: behavioural lifestyle counselling C:usual health promotion	I:none C:none Total:883	I:316 C:567 Total:883	none	I:316 C:567 Total:883	none	I:53.5% C:61.9% Total:58.8%	Data on drop-out, lost to follow up and missing was not reported.
Total			I:1834 C:2076 Total:3910			I:633 C:721 Total: 1354		2 trials did not reported no. of participants finishing the study
Footnotes C: control; I: intervention; ITT: intention-to-treat; None: not reported; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; TTM: transtheoretical model								

Participants and setting

There were a total of 3910 participants in the five trials, 1834 of which were randomised to intervention groups and 2076 to control groups. The total number of participants who had actually completed the trials was 1354 (which consisted of 663 of the intervention and 721 of the control groups) and two trials (119, 120) did not report the data (including the proportions for control and intervention groups). Four trials reported the percentages of participants for intervention and control groups finishing each study (80, 83, 118, 119), and one trial did not (120). The participants who completed the studies ranged from 53.5% to 79.2% for the intervention groups and in the control groups from 43% to 82.4%. All participants in the included trials were analysed on the basis of intention to treat (ITT). The overview of the included studies' overall population is shown in 'Table 3' above

The trials were conducted amongst overweight and obese adult participants only. Females were recruited more than males in two trials (80, 119) and another two trials (83, 120) recruited more male than female participants. One trial (118) recruited female participants only. Four trials included both men and women, and one trial included women only. Three trials reported age of participants as a range of values as such: 25 to 54 years (118); 18 to 75 years (83); and 40 to 69 years (80), whereas two trials (119, 120) reported age as a mean value. The included trials used a variety of weight entry criteria: most studies used BMI (BMI) measures only (BMI cut off points and BMI range), whilst one trial used BMI with waist-hip-ratio (WHR). Of the two trials that used BMI cut off points only, one used BMI greater than 30 (118) and the other used BMI greater than 27 (120). One trial (80) used BMI greater than 25, alongside WHR for men and women. Of the two trials that applied BMI range, one applied the range BMI 25 to 39.9 (83) and one applied the range BMI 25 to 35 (119). Overall, the studies included participants within the BMI range of 25 to 39.9.

Three trials (83, 118, 119) included participants with no co-morbidities and two trials included participants with one or more co-morbidities, such as type 2 diabetes mellitus (120) and hypercholesterolaemia (80). Three trials reported that included participants were on no medication and the other two trials included participants on a variety of medication, such as psychotropic drugs (121), insulin and oral antihyperglycaemic agents (120). The majority of participants in the included trials were white or Caucasian and other ethnic groups include

Black, Hispanic, Asian and others. All studies were community based and the range of settings in which they were conducted included general practices, university campuses and homes. The majority of interventions were delivered by health professionals, including weight loss advisors, dieticians, practice nurses, health educators and counsellors. One trial did not state which personnel conducted the intervention (83). Three studies were conducted in the United States of America (83, 118, 121), one in the UK (119) and one in Canada (120). The included trials' baseline characteristics are stated in 'Table 4'.

Table 4: The included trials' baseline characteristics

Study ID/ Characteristics	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Steptoe 2001
Intervention(s) & control(s)	I: pedometer + TTM SOC C: pedometer only	I: SOC + diet, physical activities + stress management C: usual care	I1: PTC I2: PTC + blood test strips C1: usual diabetes treatment C2: usual diabetes treatment + blood test strips	I:TM-CD C:augmented usual care	I:behavioural lifestyle counselling C:usual health promotion
Participating population (n)	56	1277	1029	665	883
Country/location	USA/College	USA/Nationwide	Canada (Southern Ontario, Nova Scotia)/general diabetes population	USA (Ohio)/15 primary care practices	UK/20 General practices
Sex [female% / male%]	100/0	47/53	48/52	I: 70/30 C: 67/33	I: 54/46 C: 54/46
Age [range, mean years (SD)]	25-54 41.5 (7.6)	18-75 45.37	age range: none I1: 55.12 I2: 54.58 C1:54.60 C2:54.86	age range: none I: 40 to 49 (42%), 50 to 59 (42%), 60 to 69 (16%) C:40 to 49 (38%), 50 to 59 (42%), 60 to 69 (20%)	age range: none I: 48 C:46
Body mass index [kg/m ² (SD)]	>30 31.2 (6.6)	25-39.9 30.75	>27 I1: 32.22 I2: 31.98 C1:31.59 C2:31.43	>25 kg/m ² BMI 25-29.9 (20%) BMI 30-34.5 (34%) BMI 35-39.0 (23%) BMI 40.0+ (23%)	25-35
Duration of disease for co-morbidities [mean years (SD)]	None	None	Diabetes: I1: 10.43 I2: 10.09 C1:10.24 C2: 11.15	hypertension: none, elevated blood cholesterol: none, osteoarthritis: none, stomach	smoking: none, high cholesterol: none

Study ID/ Characteristics	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 2001
				problems: none	
Duration of intervention	6 weeks	9 months	12 months	24 months	4 months
Duration of follow up	at 6 weeks	12 & 24 months	3, 6, 9 & 12 months	6, 12, 18 & 24 months	4 & 12 months
Ethnic groups [%]	caucasian (86), others (14)	white, not hispanic (79.1), hispanic (7), black not hispanic (6.5), other (5.4), asian or other pacific islander (0.9), american indian or alaskan native (0.9), missing (0.3)	none	african american (55), others (none)	white (96.2), black or indian (1.7)
Footnotes C: control; I: intervention; None: not reported; PTC: pathways to change; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; TTM: transtheoretical model					

Interventions

The TTM SOC was used in different ways in the trials, as discussed below. Two trials used TTM SOC as an assessment of participants' stage of change and a framework for intervention (80, 83), whilst two trials used it to assign and assess participant's SOC (83, 119). One trial used TTM SOC algorithm to assign participants' SOC for PA (118).

In the trials, TTM SOC was used with PA or exercise, dietary modification and other interventions. One trial evaluated PA intervention (by using a pedometer and brochure on PA) compared with pedometer only and indicated no weight loss (118). Another trial evaluated dietary modification (by dietary assessment and telephone counselling) plus other interventions (such as information on self-help, diabetes care and blood test strips) compared with usual treatment (blood test strips only), and also showed no weight loss (120). Similarly, a trial evaluating both diet (via fat intake reduction) and PA counselling sessions (based on number of risk factors) showed no weight loss (119). Another trial evaluated a combination of PA, diet and other interventions, such as stress management strategies (by giving individualised feedback) compared to usual care and showed no weight loss (83). Finally, a trial involving assessment, advice and 'prescription' of dietary changes and PA (alongside anthropometric evaluation) compared to augmented usual care resulted in early weight loss at

six months only, but no weight loss at the end of the trial, other than decreased waist girth (121). The description of interventions for the included trials is shown in ‘**Table 5**’.

The trials varied in length of intervention (from six weeks to 24 months) and the median length was nine months. Only one trial (121) had a duration of intervention longer than 12 months, whilst the others were 12 months (120), nine months (83), four months (119) and six weeks (118) respectively. Three trials reported follow up only at the end of intervention (80, 118, 120), whilst two trials followed up participants at intervals after intervention (83, 119).

Table 5: The descriptions of interventions for the included trials

Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 2001
Intervention: Application of TTM:	I: pedometer +TTM SOC: record daily steps using pedometer, PA brochures (pre- intervention) & email reminders weekly TTM SOC use as algorithm for PA to assign participant's SO	I: assessment and feedback on fat intake, PA per week & stress management at baseline, 3, 6, & 9 months TTM SOC use as assessment and feedback construct for Diet, PA and stress management	I1: PTC I2: PTC (diabetes manuals, monthly newsletters, telephone counselling, staged-based personalized assessment report quarterly & dietary intake assessment) + blood testing strips TTM SOC use to assign and assess participants	I:TM-CD: Psychosocial evaluation every 6 months; SOC assessment for five target behaviours every 2 months; assessment on anthropometric, dietary & exercise every 6 months; 10min counselling on diet; dietary & exercise prescriptions; & monetary reward for completing each post baseline assessment. TTM SOC use as framework for intervention and to assess participants	I: behavioural lifestyle counselling: baseline assessment of SOC; counselling (fat intake reduction, PA) based on no. of risk factors (2 given 3 counselling sessions & 1 given 2 counselling sessions) after 4 months and 12 months. TTM SOC use as algorithms to assign and assess participants
Control: Usual advice on diet, exercise or both	C: pedometer only: record daily steps using pedometer, email reminders weekly	C: usual care	C1: usual diabetes treatment (family physician visits, diabetes education) C2: usual diabetes treatment (family physician visits, diabetes education) + blood testing strips	C: augmented usual care: assessment on anthropometric, dietary & exercise every 6 months; 10min counselling on diet; dietary & exercise prescriptions; & monetary reward for completing each post baseline assessment.	C: usual health promotion (education on healthy life style, encouragement and advice)
Footnotes	C: control; I: intervention; PA: physical activities; PTC: pathways to change; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; TTM: transtheoretical model				

Outcomes

The primary outcomes measured in the review were weight loss maintenance (at one year to 5 years and above) and health-related quality of life. Three trials reported weight loss at 12 months (120) and 24 months (80, 83). The secondary outcomes measured in the included trials were self-reported change in calorie intake habit (83, 120), change in fatty food intake behaviour (119, 120), change in fruit and vegetable consumption (83, 120), change in PA frequency (83, 118, 119) and duration (118, 121), waist girth change (121), death from any cause (83, 121), progression through SOC (83, 118-120) and weight gain as an adverse event (121). The details of the outcomes were stated in the 'Characteristics of included studies' table (**Appendix 4**) and table of 'Primary and secondary outcomes' (**Appendix 8**).

Excluded studies

There were 91 studies excluded in the review and the details are shown in the 'Characteristics of excluded studies' table (**Appendix 5**). The two main reasons for excluding those studies were as follows: (1) participants included in the studies were either children or adolescents or had a normal body weight (BMI less or equal to 25); (2) use of other theoretical frameworks for interventions (such as cognitive behaviour therapy, SET, social action theory and social cognitive theory) by the studies.

Risk of bias in included studies

The methodological quality of included studies is described in 'Characteristics of included studies' (**Appendix 4**). All trials had some methodological weaknesses according to the criteria applied. Just one of the trials reported adequate methods for randomisation, allocation concealment and blinding, and met the reporting outcomes criteria for low risk of bias, whereby the plausible bias within the study was unlikely to seriously alter the results (80). Meanwhile, each of the remaining trials had high risk of bias for one or more key domains (83, 118-120). Therefore, with only one low risk bias trial and four high risk bias trials included in the review, the proportion of information from trials at high risk of bias are

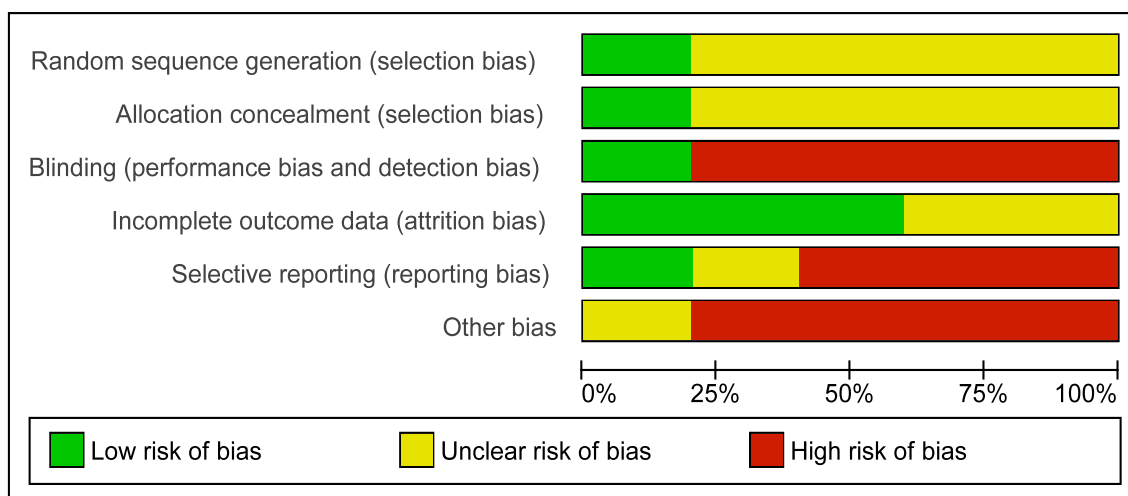
sufficient to affect the interpretation of the results across studies. The assessment findings for each domain are explained below, and shown in the 'risk of bias summary' (**Figure 3**) and 'risk of bias graph' (**Figure 4**).

Figure 3: The risk of bias summary

	Adequate sequence generation?	Allocation concealment?	Blinding?	Incomplete outcome data addressed?	Free of selective reporting?	Free of other bias?
Dinger 2007	?	-	-	+	?	-
Johnson 2008	?	-	-	+	+	-
Jones 2003	?	-	-	+	+	-
Logue 2005	+	+	+	?	+	-
Steptoe 2001	?	-	-	?	+	-

Footnotes

Risk of bias summary: review authors' judgements about each risk of bias item for each included study. Each symbol refers to authors' judgement on each item; Yes (+), No (-) and Unclear (?)

Figure 4: The risk of bias graph**Footnotes**

Risk of bias graph: review authors' judgments about each risk of bias item presented as percentages across all included studies. Each symbol refers to authors' judgement on each item; Yes (+), No (-) and Unclear (?)

Randomisation

One trial (20%) reported the method of randomisation (80), whilst other trials (80%) stated that participants were randomised and no further explanation was given, thus they were graded 'unclear' for the domain based on the quality criteria (83, 118, 119). The majority of studies were subjected to high risk of bias in their randomisation methods.

Allocation (selection bias)

Only one trial (20%) reported that allocation to groups was concealed (80), whilst the rest of the included trials (80%) did not explain how the concealment was done, and were thus graded 'unclear' for the domain based on the criteria (83, 118-120). There was unclear risk of bias in the sampling allocation methods for most of the trials.

Blinding (performance bias and detection bias)

One trial (20%) explained the blinding methods (80), whereas the rest of the included trials (80%) did not explained whether the investigators or the participants were blinded during the study (83, 118-120). The majority of trials were subjected to high risk of bias (for contamination) due to lack of blinding amongst participants and investigators, however it is not possible to blind them because of the design and nature of the interventions.

Incomplete outcome data (attrition bias)

Three trials (60%) addressed the incomplete data for outcomes by reporting exclusions (83, 118) and estimating missing data using multiple imputation, whereas one trial explicitly reported the analysis on ITT (120). Two trials (40%) had no adequate information and were graded 'unclear' for the domain (80, 119). There was low risk of bias in reporting outcomes data across the included trials.

Selective reporting (reporting bias)

One trial (20%) met the quality criteria for outcome reporting, by reporting the pre-specified primary outcomes and all expected outcomes (119). Meanwhile, one trial (20%) had inadequate information and was graded 'unclear' (118). The majority of trials (60%) had high risk of bias for selective reporting of outcomes (80, 83, 120).

Other potential sources of bias

There were also other potential sources of bias identified in the included trials, for example: recall bias in three trials (80, 83, 119) and commercial source of funding in one trial (120).

Effects of interventions

Weight loss maintenance

As mentioned above, weight loss maintenance is one of the primary outcomes measured in the review. Three trials (80, 83, 120) applied TTM SOC as a theoretical framework for dietary, PA, monetary rewards and stress management interventions resulted in weight loss.

A trial that used TTM SOC with diet and blood testing strips interventions reported greater weight reduction amongst participants in action stage (individuals are ready to change their behaviour) than in pre-action stage (individuals are not ready to change behaviour) for intervention (1.38kg versus 0.65kg) in the healthy eating group at 12 months. There was a significant weight loss amongst participants in the action stage (individuals are ready to change their behaviour) compared to those in the pre-action stage (individuals are not ready to change behaviour) for intervention (1.78kg versus 0.26kg, $p < 0.01$) in both self-monitoring blood glucose (SMBG) and healthy eating groups at 12 months. The data for the outcomes measured was not completely reported (such as weight loss values in control groups in healthy eating and both healthy eating and SMBG combined) management interventions resulted in weight loss in three trials (120).

Next, another trial that applied TTM SOC in combination with diet, PA and stress management interventions showed a significant sustainable absolute weight loss in the treatment group; and more than the control group ($t_{1614} = -2.12\text{kg}$, $p < 0.05$, $df = 0.17$) for both healthy eating and exercise behaviours combined at 24 months. Weight loss of at least 5% of body weight was reported higher amongst participants in the treatment (27.4%) versus control (20.3%) groups with a significant overall effect over time ($t_{11119} = 2.07$, $p < 0.05$, OR 1.22, 95% CI 1.01 to 1.48) for healthy eating behaviour at 24 months. Similarly, weight loss of 5% or more was higher in treatment (28.8%) than control (19.4%) groups for exercise behaviour, with increasing differences over time ($t_{1711} = 1.96$, $p = 0.05$, OR 1.32, 95% CI 0.99 to 1.75). In both healthy eating and exercise behaviours combined, weight loss of 5% or more was higher amongst participants in treatment (30%) versus control (18.6%) groups at 24 months. The overall group effect for intervention had increased over time ($t_{1615} = 2.05$,

$p < 0.05$, OR 1.35, 95% CI 1.01 to 1.81). There was inadequate data given for intervention and control groups pertaining to some of the measured outcomes (for example absolute weight, weight loss of at least 5% and weight loss 5% or more) particularly at 6 and 12 months of the trial (83).

TTM SOC used together with diet, PA and monetary rewards interventions in a trial reported early (at 6 and 12 months) mean weight loss of 0.5kg (SE 0.4kg) which was greater in intervention than control groups. The mean weight change was slightly higher in intervention (-0.39kg, SE 0.38kg, 95% CI -1.1 to 0.4) versus control groups (-0.16kg, SE 0.42kg, 95% CI -1.0 to 0.7) and the weight loss difference was 0.23kg ($p = 0.50$, 95% CI -1.4 to 0.9) at 24 months of the trial (80)

Meta-analysis was not appropriate, primarily because there were different types of outcomes presented (dichotomous and continuous) in the trials. Other reasons were data for intervention and control groups was not completely reported and there were variations in the timing of outcome measurement in the trials. In two trials, weight loss was reported as a dichotomous outcome (83, 120) and in one trial as continuous outcome (80). In the two trials with dichotomous outcomes, the timing of outcome measurement varied; one trial measured weight loss outcome at 12 months (120) and the other trial measured it at 6, 12 and 24 months (83). In both trials, some data for the outcomes measured in intervention and control groups at 12 months were not reported (such as values for event and no event as well as sample size).

Health-related quality of life

Health-related quality of life is another primary outcome measured in this review but was not reported in all the included trials.

Self-reported change in dietary habit and measured change in dietary habit

There were several secondary outcomes measured in this review that include self-reported change in dietary habit and measured change in dietary habit. Three included trials (80, 83, 120) reported TTM SOC combined with diet, PA and stress management interventions resulted in significant self-reported changes in dietary habit and measures (such as change in daily calorie intake habit, change in daily energy intake and expenditure habits).

Change in daily calories intake habit

A trial using TTM SOC combined with diet and blood testing strips interventions reported lower calorie intake from fat amongst participants in the intervention group compared to the control group (35.34% versus 36.1%, $p < 0.04$) for healthy eating at 12 months (120). TTM SOC application in combination with diet, PA and stress management interventions in a different trial showed more participants progressed to action or maintenance stage in the intervention group versus the control for healthy eating behaviour at 6 (43.9% versus 31.3%), 12 (43.10% versus 35.2%) and 24 months (47.5% versus 34.3%). The overall group effect for all time points was significant ($t_{11119} = 5.02$, $p < 0.001$, OR 1.61, 95% CI 1.33 to 1.94). Healthy eating is defined as reducing dietary fat to 30 per cent of calories as well as calorie reduction of 500 calories per day. The term 'progress to action or maintenance stage' refers to individual's readiness to engage in a healthy behaviour (83).

TTM SOC combined with diet, PA and monetary reward interventions in a trial reported no significant mean change in energy intake per day in the intervention group compare to the control ($p = 0.69$) at 24 months. There was a significant reduction in the mean energy intake per day for both groups combined (~ 250 kcal/d, $p < 0.0001$) throughout the 6 to 24 months follow-up. The difference in energy expenditure for intervention group versus the control was not significant ($P = 0.31$) at 24 months, whereas for both groups combined there was a significant increase in mean energy expenditure per day (~ 2 kcal/kg per day, $P = 0.04$). The data on energy expenditure at 6, 12 and 18 months was not explicitly reported. The data for

the intervention group and the control pertaining to both outcomes (mean energy intake and expenditure) was not given (121).

Meta-analysis of the outcome measured (change in daily calories intake habit) was not appropriate, mainly due to different types of outcomes reported (dichotomous and continuous) in the three trials stated. Also, some data was not given and there were variations in timing of outcome measurement in the trials. The change in daily calorie intake habit measured was expressed as a 'dichotomous' variable in two trials (83, 120) and as a 'continuous' variable in one trial (80). In the two trials with dichotomous variables, the timing of outcome measurement varied; one trial measured the weight loss outcomes at 12 months (120) and the other measured at 6,12 and 24 months (83). It would be possible to do meta-analysis for change in daily calorie intake habit at 12 months for both trials if data for the outcome were not missing (such as sample size for intervention and control groups).

Change in fatty food intake

TTM SOC with diet and PA interventions resulted in an increased readiness to reduce fat intake in intervention (67.1%, 95% CI 56.7 to 76.1) compared to the control (53.6%, 95% CI 45.8 to 61.3) groups at 4 months. At 12 months, more participants in the intervention groups (68.4%, 95% CI 61.1 to 74.8) reduced their fat intake versus control groups (59.2%, 95% CI 49.2 to 68.6). The strength of association between intervention and the behaviour change was stronger at 4 months (OR 2.5, 95% CI 1.30 to 3.56) than 12 months (OR 1.26, 95% CI 0.73 to 2.18) (119). TTM SOC with diet intervention and blood testing strips also showed significant increase among participants taking up healthy eating behaviour (consuming diet with less than 30 percent of fat) in intervention (32.5%) versus control (25.5%) groups ($P < 0.004$) at 12 months (120).

Meta-analysis of the outcome was not appropriate here because some data were not reported and because of variations in timing of outcome measurement in the given trials. One trial measured the outcome at 4 and 12 months (119), whilst the other was at 12 months only (120). Although, it was potentially possible to do meta-analysis for change in fatty food intake habit at 12 months for both trials, data for the outcomes measured, such as event, no event and sample size for the intervention and control groups were not reported.

Change in fruit and vegetable consumption

Two trials reported significant changes in fruit and vegetable consumption at 6, 12 and 24 months. TTM SOC applied with diet intervention resulted in a significant ($P=0.016$) increase in fruit intake per day in intervention (OR 1.89) versus control (OR 1.68) groups and a significantly ($P=0.011$) higher vegetable intake (2.24 versus 2.06) in the healthy eating intervention at 12 months of the trial. The strength of association between intervention and the outcomes above is stronger for fruit servings intake compared to vegetable servings intake at the end of the trial. There is no data (event, no event and sample size) reported for intervention and control groups for the outcomes measured (120). Meanwhile, another trial that used TTM SOC in combination with diet, PA and stress management interventions showed greater fruit and vegetable consumption amongst participants in intervention than control groups at 6 (44% versus 31.4%), 12(45.3% versus 39.6%) and 24 months (48.5% versus 39.0%). Based on the overall group effect, the strength of association between the intervention and outcome was strong at all time points ($t_{1856}=5.01$, $p<0.0001$, OR 1.63, 95% CI 1.34 to 1.97). There was no data (no event occurred and sample size) reported for intervention and control groups of the outcomes measured (83).

Meta-analysis of the outcome was not appropriate, mainly because some data for outcomes measured in intervention and control groups were not reported and there were variations in the timing of outcome measurement between trials.

Self-reported uptake in PA and measured change in PA

Secondly, self-reported uptake in PA and measured change in PA was secondary outcome measured in this review. There were four trials (83, 118, 119, 121) reporting significant self-reported uptake and measured changes in PA using TTM SOC in combination with diet, PA, smoking and stress managements interventions at 6 weeks and 4, 9 and 24 months. The outcomes reported were mainly changes in PA frequency (e.g. total steps and per day) and duration (e.g. total minutes and per week), types of exercise and intensity were not reported by the given trials.

Change in PA frequency

A trial applying TTM SOC combined with diet and PA interventions showed increased readiness to exercise amongst participants in the intervention group (32.2%, 95% CI 23.7 to 42.0) versus the control (23.9%, 95% CI 17.8 to 31.2) at 4 months and similarly for the intervention group (30.6%, 95% CI 21.8 to 41.2) versus the control (28.9%, 95% CI 24.0 to 34.3) at 12 months. The strength of association between intervention and outcome measured (increase readiness to exercise) was strong at 4 months (OR 1.89, 95% CI 1.07 to 3.56), as well as at 12 months (OR 1.68, 95% CI 1.08 to 2.61) of the trial. The outcome measured data for intervention and control groups was not fully reported (such as for event, no event and sample size) (119). TTM SOC in combination of diet, PA and stress management interventions in another trial showed an increase in exercise habit amongst participants in intervention compared to control groups at 6 (43% versus 34.6%), 12(37.7% versus 35.9%) and 24 months (44.9% versus 38.1%). The group effect showed strong association between intervention and outcomes measured at baseline and 6 months, which were maintained at all time points ($t_{1856}=5.01$, $p<0.0001$, OR 1.63, 95% CI 1.34 to 1.97). There was incomplete data (the proportions of no event and sample size) stated for intervention and control groups (83). Another trial using TTM SOC in combination with PA intervention alone showed a significant increase in the total daily steps from 6,419 (SE 2386) in week one to 7984 (SE 2742) in week six ($P < 0.001$) for both intervention and control groups combined (118).

Meta-analysis of the outcomes was not possible mainly because the trials had different types of outcomes (dichotomous and continuous), some data was not reported and variations existed in the timing of outcome measurement in the trials. The dichotomous outcomes were reported in two trials (83, 119) and continuous outcome in one trial (118). In the two trials with dichotomous outcomes, the timing of the outcome measurement varies where one trial measured the outcome at 4 and 12 months (119) and the other at 6, 12 and 24 months (83). The data for the outcome measured at 12 months in the two trials was not adequately reported as stated above.

Change in PA duration

TTM SOC was used in combination with PA intervention only in one trial and this showed a significant increase in weekly time spent walking ($P = 0.002$) for both the intervention and control groups combined at 6 weeks (118). In another trial, TTM SOC combined with diet, PA and monetary reward interventions resulted in a significant increase in the mean self-reported exercise minutes per week in intervention versus control groups ($P=0.008$) from 6 to 24 months; the mean difference between the groups was 31.5 minutes (SE 12 minutes) (80).

Meta-analysis cannot be done, primarily because of different timing of outcome measurement and variation in the measurement scales used in each respective trial. The first trial measured outcomes at 6 weeks only and used median scores (118). Meanwhile, the second trial measured the outcomes at 6, 12, 18 and 24 months and expressed it as mean values (change in exercise minutes per week) as well as mean difference (80).

Change in weight loss measures

Thirdly, change in weight loss measures was the secondary outcome measured in this review. TTM SOC combined with diet, PA and monetary rewards interventions in a trial reported no significant mean waist girth change in the intervention compared to control groups ($p=0.57$).

However, the effects for both groups combined showed a significant decrease in mean waist girth (1.7cm SE 0.4cm, $P = 0.0001$) at 24 months (80)

Progression through SOC

There were four trials that included reported progression through SOC as an outcome measured in the studies (83, 118-120), but this outcome was not included in outcomes measured in this review. The term 'progress to action stage' refers to individuals who have changed behaviour within the last 6 months, whereas 'maintenance stage' refers to individuals who have maintained the behaviour change for at least 6 months. A trial applying TTM SOC combined with diet and PA interventions reported the odds amongst participants moving to action or maintenance stage in the intervention group versus the control for fat reduction behaviour was 2.15 (95% CI 1.30 to 3.56) at 4 months, and 1.26 (95% CI 0.73 to 2.18) at 12 months. For PA, the odds amongst participants progressing to the action or maintenance stage in the intervention group compared to the control group at 4 months was 1.89 (95% CI 1.07 to 3.36), and 1.68 (95% CI 1.08 to 2.61) at 12 months. The data pertaining to the intervention and control groups was not completely reported (119).

Another trial using TTM SOC in combination with diet and blood testing strip interventions reported that more participants in intervention group (43.4% for 'pathway to change' plus strips and 27% for treatment as usual plus strips) progressed to the action stage in comparison to the control group (30.5% for 'pathway to change' alone and 18.4% for treatment as usual plus strips) at 12 months in self-monitoring blood glucose intervention ($p < 0.001$). Similarly, there was a greater proportion of participants moved to action or maintenance in intervention (32.5%) versus control (25.8%) groups for healthy eating behaviour ($p < 0.001$). The data for the outcomes measured in the intervention group and the control was not completely given (specifically sample size and proportions of no event) (120). TTM SOC applied with PA intervention only in a trial showed participants moved forward at least one stage (53.6%, $p < 0.001$), regressed one stage (5.4%) and maintained at their existing stage (41.1%) both in the intervention and control groups combined at 6 weeks. The outcome data was not

distinctively reported for the intervention and control groups (such as date of event and no event, as well as sample size) (118).

Meanwhile, TTM SOC used in combination with diet, PA and stress management interventions in another trial showed that a greater proportion of participants progressed to the action or maintenance stage (individuals' readiness to engage in healthy behaviour) in the intervention group rather than the control for healthy eating outcome at 6 (43.9% versus 31.3%), 12 (43.10% versus 35.2%) and 24 months (47.5% versus 34.3%) of the trial. The overall group effect for all time points showed a strong association between the intervention and measured outcome ($t_{11119}=5.05$, $p<0.001$, OR 1.61, 95% CI 1.33 to 1.94). For exercise outcomes, more participants in the intervention group compared to the control moved to the action or maintenance stage at 6 (43% versus 34.6%), 12(37.7% versus 35.9%) and 24 months (44.9% versus 38.1%). There was a significant group effect at baseline and 6 months that was maintained at all time points ($t_{1711}=2.25$, $p<0.05$, OR 1.27, 95% CI 1.03 to 1.57). In the fruit and vegetable outcome, many participants in the intervention group moved to action or maintenance stage in comparison to the control at 6 (44% versus 31.4%), 12(45.3% versus 39.6%) and 24 months (48.5% versus 39.0%). Based on the overall group effect, the strength of association between the intervention and outcome was strong at all time points ($t_{1856}=5.01$, $p<0.0001$, OR 1.63, 95% CI 1.34 to 1.97). The data of outcome measured was not adequately reported for the intervention and control groups (specifically values for no event and sample size) (83).

Meta-analysis of the outcome was not possible, mainly due to different types of outcomes presented (dichotomous versus continuous), some data not being reported and variations in the timings of outcome measurements in the given trials. The progression through SOC was reported as a dichotomous outcome in three trials (83, 119, 120) and a continuous outcome in one trial (118). The timing of outcome measurement of the three trials with dichotomous outcomes varies: one trial measured the outcome at 4 and 12 months (119), another trial at 12 months only (120), and a long-term trial measured outcome at 6, 12 and 24 months (83). It was not possible to do meta-analysis for the measured outcome at 12 months in three trials

because data for the outcome measured in intervention and control groups was not given (such as values of no event and sample size).

Adverse events

Morbidity as an adverse event outcome was not reported by the included trials. Death as an adverse event was reported in two included trials; three patients died in one trial (80) and there was only one death in the other trial (83), during follow up. The reported deaths were declared not related to the trials. None of the included trials reported cost as an adverse event for outcome. There was a significant weight gain for both intervention and control groups combined after 12 months in one trial ($p < 0.0001$), but there was no other data reported on the given outcome measured (80)

Publication and small study bias

In this review, it was not possible to assess reporting bias using funnel plots because there were only five trials included (thus, this might affect the power of the tests to distinguish chance) and furthermore the types of outcomes varied and the estimate effect measures used in each trial differed. Three trials with medium sample size reported dichotomous outcomes with estimate effect measures, namely p-value (P), odd ratio (OR) and 95-percent CIs (n=1277) (83); OR and 95-percent CIs (n=883) (119); and p-value only (n=1029) (120). Meanwhile, two trials reported continuous outcomes; one trial had a small sample size (n=56), with p-value as estimate effect measure (118), whereas the other had medium sample size (n=665) and used standard error, p-values as well as 95-percent CI as the estimate effect measures (80)

3.4. Discussion

Summary of results

Relatively few trials were identified that met the criteria for the review and most were relatively recent (published in the last 10 years). The trials had small to medium sample sizes, with 3910 participants evaluated in total. They were conducted in community settings, were mainly delivered by health professionals. Other key characteristics of those trials were longer duration of intervention (9 to 24 months) and follow up (12 to 24 months), as well as using TTM SOC in combination with PA, diet and other interventions. Therefore, the way in which TTM SOC was applied in each trial may have had a critical impact on the outcomes measured. BMI was the most common body weight measure used in the trials.

This review demonstrated that TTM SOC and a combination of PA, diet and other interventions resulted in minimal weight loss, and there was no conclusive evidence for sustainable weight loss, particularly after 12 months. However, TTM SOC combined with diet, PA and other interventions (such as feedback reports, anthropometric measurements and counselling) had a positive impact on fruit and vegetable consumption, as well as increased exercise outcomes behaviour that were sustainable over longer periods (12 to 24 months). There were limited association measures between TTM SOC and outcomes reported by the included trials.

TTM SOC was used inconsistently as a theoretical framework for intervention across the included trials, which may impact on outcomes. TTM SOC was used in three different ways: as an assessment tool and framework for intervention, as an assessment and assignment tool only, and in algorithm form to assign participants' SOC for intervention. Trials that used TTM SOC as an assessment and intervention framework, rather than just as a tool to assign and assess stage of change, reported minimal weight loss.

The included trials were mainly performed on an ITT basis. The trials were heterogeneous, particularly in terms of interventions and outcomes. The majority of the trials can be categorised as high-risk bias trials due to inadequate information on methods of randomisation, intervention concealment and blinding. Other potential sources of bias were also identified, such as sampling, selection and recall bias.

External validity

In general, the findings of the review were generalisable to overweight and obese adults who were undergoing lifestyle modification programmes for weight loss, specifically programmes which were based on TTM SOC in community settings. There were differences identified in the populations from which the samples of the included studies were drawn, for examples more females than males were recruited, the age range values varied in three trials (80, 83, 118) and the majority of participants were white or Caucasian. In addition, two trials (118, 120) recruited participants from selected populations (university students and people with diabetes respectively). The given sources of recruitment and differences might affect the generalisability of the findings to other settings. There were no significant differences in outcome for participants with or without co-morbidities in the included trials. Also, the included trials were conducted in various countries, which may increase the generalisability of the findings to other international settings.

Relevance to review's objectives

The included studies contain sufficient information to examine the effectiveness of dietary and PA interventions based on TTM SOC for weight loss in overweight and obese adults. However, the review may benefit from studies with longer durations of intervention and follow up to assess the sustainability of the weight loss, particularly beyond two years. The relevant points in the inclusion criteria were investigated and presented in the results, including additional and adverse outcomes, a summary of outcomes and potential bias.

Relevance to current practice

Obesity is one of the world's fastest growing health threats, and commissioning and developing obesity management programmes is a priority for policy makers and health system administrators in health systems across the world. This review can be used to better inform the planning, implementation and evaluation of such programmes. The review also informs practitioners on existing evidence and expected outcomes (such as weight loss, change in PA and dietary intake) when using TTM SOC weight management programmes. Finally, it can also serve to inform and enhance patients' understanding of the effectiveness and limitations of their treatment regimes. In practice, TTM SOC must be applied with caution, because it has a variable impact depending on how it is used and with what other factors (such as whether it is used in combination with other strategies and the duration of intervention and follow up).

Potential biases in the review process

There were differences in types, content and duration of interventions in five trials. For instance, only two trials (80, 83) that had clearly reported using TTM SOC as theoretical framework for recruiting appropriate participants and tailoring interventions for those individuals. It was not consistently used as guideline for tailored intervention for participants. Although, the description of intervention in inclusion criteria of studies was inclusive of lifestyle modification strategies, these variations in interventions may affect the outcomes of each study and failure to measure effects of interventions. Furthermore, the duration of interventions considerably varies in all trials at 6 weeks, 4 months, 9 months, 12 months and 24 months, respectively. There were also variations in controls of included trials and the strategies delivered were pedometers, email reminders, diabetes treatment, diabetes education, blood testing strips and education on a healthy lifestyle. Also, some trials with dichotomous outcomes that had potential for meta-analysis did not completely reported their data and the authors were not contactable. It was not possible to assess reporting bias using funnel plots, primarily because the types of outcomes and the estimate effect measures used in each trial were different. The above limitations may introduced bias to the review indirectly.

3.5. Conclusion

This review provided evidence for the efficacy of dietary and PA interventions based on the TTM SOC in producing sustainable weight loss in overweight and obese adults. TTM SOC and a combination of physical activities (PA), diet and other interventions resulted in minimal weight loss, and there was no conclusive evidence for sustainable weight loss. The impact of TTM SOC as a theoretical framework in weight loss management may depend on how it is used as a framework for intervention and in combination with other strategies like diet and PA. Nevertheless, health managers, administrators and practitioners can use evidence from this review to plan, implement and evaluate weight management programmes. For patients, the review may enhance their understanding of the effectiveness and limitations of their treatment regimes. Overall, the review may help to improve knowledge, understanding and practice in tackling the important global health challenge of obesity.

4.0. Development and application of Imperial College Obesity Assessment Framework (IC-OSAF) for analysing local obesity strategies

4.1. Background

The House of Common Health Committee highlighted that ineffective implementation of obesity strategies and policies at community level was a critical issue for England (17). The prevention and management of obesity and overweight have been national governmental concerns for many years, and had been highlighted in many published reports, including: ‘Cross-Government Health of Nation Strategy’, Department of Health, 1992, and ‘Saving Lives: Our Healthier Nation’, Department of Health, 1999 (37). The national obesity strategy and policy was heavily scrutinised and was criticised for being ineffective in tackling the issue of obesity, as reported in the ‘Tackling Obesity in England’ report in 2001 (26). Evidently, there is a critical gap in the ‘upstream’ interventions, such as policies or strategies at national or regional level for the prevention of obesity and overweight in both children and adults (37). There was a strong call to examine obesity strategies and policies in England. There was no readily available framework for evaluating obesity strategies at a local population level in England. The existing policy analysis frameworks can be considered very generic and not tailored or detailed enough to evaluate local obesity strategies. This chapter discusses the development of obesity strategies assessment framework and its application to four PCTs in north-west London (NWL) England. The objectives of this work were to:

- a) examine the existing strategies for the prevention and management of obesity which were implemented at local level (PCTs) in NWL in England
- b) review current obesity strategies analysis models
- c) develop a new assessment framework suitable for evaluating obesity strategies at a local level which was named the Imperial College Obesity Strategy Assessment Framework (IC-OSAF)
- d) apply the IC-OSAF on the obesity strategy implemented at Hammersmith and Fulham (H&F) PCT
- e) apply the IC-OSAF to assess the obesity strategy implemented at other PCTs in NWL
- f) assess the validity of IC-OSAF

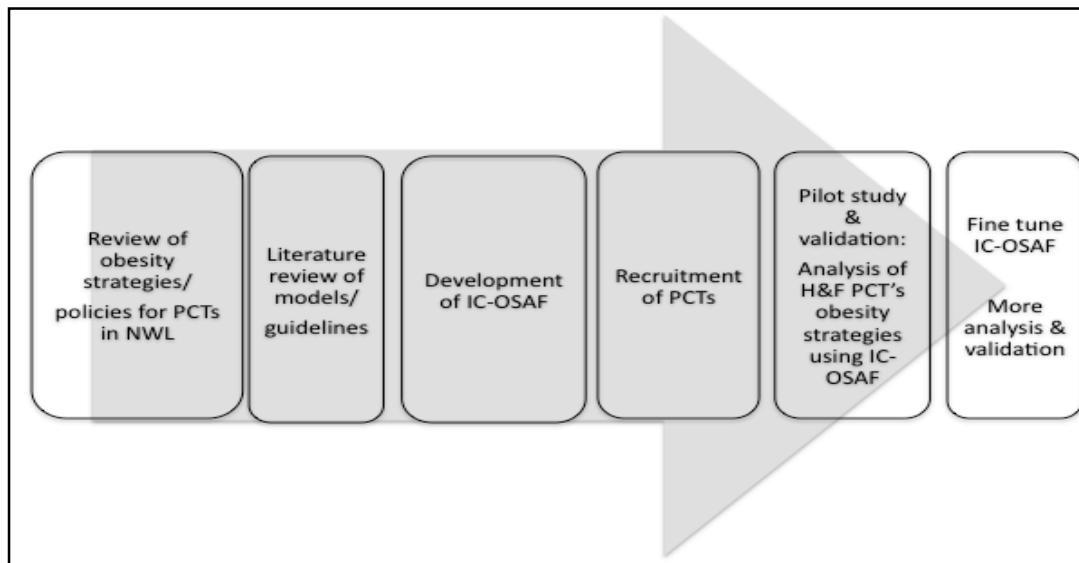
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- g) identify potential policy issues for effective implementation of obesity strategies at the local level, and consequently provide recommendations

WHO defines health policy as an agreement or consensus on the health issues, goals and objectives to be addressed, with a set of priorities among those objectives and main directions for achieving them (122). Policy analysis is a generic name for a range of techniques and tools to study the characteristics of established policies, how the policies came to be and what their consequences are (123). Policy analysis is also considered as both a descriptive activity that dissects and describes how policy is formulated; and is also prescriptive, aiming to influence and change policy making (124). Therefore, it is imperative to distinguish between analysis of policy process and the analysis of policy content in the policy analysis approach. The main distinction is that process analysis focuses on policy formulation, whereas content analysis focuses on the substance of the policy (124, 125). The above terms were adapted in course of the policy analysis approach in this project.

4.2. Methods

In this project, the methods used were documentation review of obesity strategies implemented at PCTs in NWL England, literature review of policy analysis models, developing IC-OSAF, recruitment of PCTs, piloting IC-OSAF to H&F PCT, applying IC-OSAF to other PCTs, data extraction and analysis by two independent assessors, and validation of results with experts. The flow of the study is shown in **‘Figure 5’**.

Figure 5: The flow of the study



Documentation review of obesity strategies for PCTs in North West (NW) London, England

Eight PCTs in NWL, England were selected due to their convenient location and the limited availability of resources to conduct a large-scale project. The PCTs are Westminster, Brent, Harrow, Hillingdon, Hounslow, Ealing, Hammersmith & Fulham, and Kensington & Chelsea. At the initial stage, documentation review (including reports and policies related to overweight and obesity strategies) was conducted for each PCT using web searches. The purpose is to ensure the feasibility of conducting the study in terms of availability and accessibility to the documents. The key findings of the review are stated (and shown in summary ‘**Appendix 9**’, ‘Obesity strategy for PCTs in north west london’) below :

- All PCTs reported having obesity strategies for adults, teenagers (13-19 years) and children (below 12 years) which indicate availability and accessibility of the policies.
- The overweight and obesity strategies implemented are community based, workplace based and primary care based for adults. For teenagers, the strategies used are often school and community based. The strategies used are a mixture of community, workplace and primary care based.

-
- There are various programmes implemented at different level of the community and targeted at different age groups. The two most common interventions used are dietary change and PA.

Literature review of policy analysis models

The development of obesity strategies assessment framework phase started by reviewing existing policy analysis frameworks or models that were relevant to the scope of this project. The policy analysis models and guidelines for obesity management reviewed were the Health Impact Assessment framework (HIA), NICE guidelines, UK Obesity Tool Kit, WHO Global Strategy on Diet, PA and Health (WHO DPAS), Bardach's 'Eightfold Path Framework' (EPF) and Collin's health policy analysis framework (HPAF). There were three main criteria applied for selection of the new framework. The model was used in health policy analysis context. It can evaluate content of a policy and apply at local rather than national level. The most applicable frameworks used in the development of the 'Obesity Strategy Analysis Framework (OSAF)' were Bardach's EPF, Collin's HPAF and NICE guidelines. They were selected as the basis of the framework and are amongst the widely used frameworks in policy analysis, while NICE is the standard setting body for England's NHS.

a) Bardach's Eightfold Path Framework

Bardach's 'Eightfold Path' is a generic decision-making tool often used to analyse the content of policy strategies, particularly for public policy analysis that can be undertaken by policy analysts in a relatively short time frame. The framework consists of eight steps (as shown in 'Figure 6'):

- (1) define the problem- in an evaluative form and quantify if possible to calibrate the magnitude of the issue;
- (2) assemble evidence — involves reviewing documents and literature and using statistics, as well as interviewing people;
- (3) construct the alternatives — refers to making a list of all the alternative strategies of intervention to solve or mitigate the problem;

-
- (4) select the criteria — commonly used evaluative criteria are efficiency, equality, equity, fairness, justice, freedom, community and process values. Practical criteria that are commonly used include: legality and political acceptability, as well as robustness and improvability;
 - (5) project the outcomes — anticipating for each of the alternatives on the current list realistic and relevant outcomes which are important to the analyst;
 - (6) confront the trade-offs — a process when one of the policy alternatives under consideration is expected to produce a better outcome than any of the other alternative, then one must clarify the trade-offs between outcomes associated with different policy options for the sake of the client;
 - (7) decide — refers to checking on how well the analysis is done up to this stage and decide what to do next. At this point, the analyst must be able to convince oneself of the plausibility of some course of action, otherwise one will not be able to convince the clients or stakeholders;
 - (8) tell your story — the policy analyst attempts to explain the basic idea of the best chosen alternatives in satisfactorily simple and down-to-earth terms.

Although, the framework offers a step-by-step guidance for policy analysis, these steps do not have to be taken rigidly or in the exact order, nor are all of them necessarily significant in every problem (126). The details of the framework are described in ‘**Appendix 10**’ (‘Description of Bardach’s Eight-fold Path Framework’).

b) Collins’ Health Policy Analysis Framework

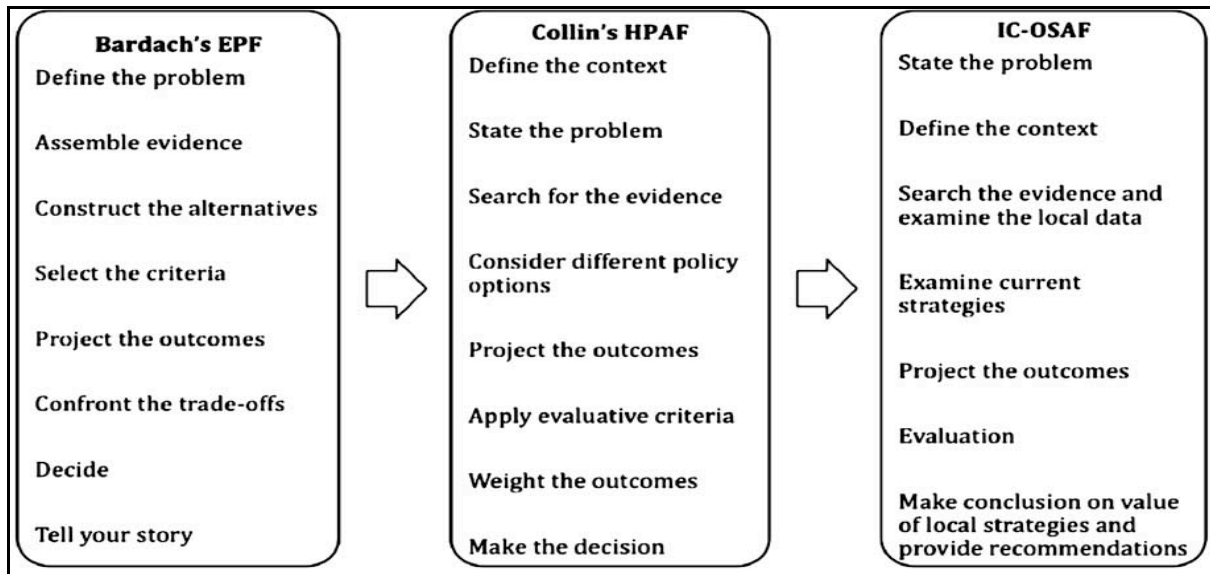
Collins’ HPAF differs from Bardach’s ‘EPF’, as it is designed specifically for the health policy analysis mainly used by policy makers needing to make decisions on health issues. According to Collins, health policy analysis is a political as well as social activity and can be very time consuming. Policy makers may face having to make critical decisions in a very short period of time. Therefore, a simplified framework for health policy analysis, which is practical, less time consuming and less resource intensive, is needed in conducting policy analysis studies. Collins’ HPAF modifies Bardach’s ‘EPF’ further into the following steps:

(1) define the context, (2) state the problem, (3) search for the evidence, (4) consider different policy options, (5) project the outcomes, (6) apply evaluative criteria, (7) weight the outcomes, and (8) make the decision. There are two distinctive features for Collins' HPAF: looking at different existing policies before making decisions and making use of evaluation measures in the analysis (125). The details of the framework are described in 'Appendix 11' ('Description of Collin's HPAF')

Development of Imperial College Obesity Strategy Assessment Framework (IC-OSAF)

Bardach's EPF was the underpinning theory of the new obesity strategies analysis framework, whereas Collins' HPAF provided the framework with health policy analysis context and components (particularly evaluative and evidence-based approaches). The new framework adapted concepts from both frameworks and used NICE guidelines as the benchmark in the analysis criteria. Examination of the local data (step 3) and current strategies (step 4) are the two main items added in the framework to make it more applicable to obesity and health policy analysis approaches at community level in the context of the UK. The evaluation process (step 6) is modified according to criteria required by NICE guidelines and health programme evaluation approaches. The new framework was named Imperial College Obesity Strategy Assessment Framework (IC-OSAF). IC-OSAF distinctively has reformed the final step of the framework by considering the existing local strategies, as well as evidence from the literature and other official reports as the basis to decide on the value and generate recommendations for the policy. The evolution of IC-OSAF is shown in 'Figure 6'.

Figure 6: Evolution of IC –OSAF



The description of the IC-OSAF is shown in ‘**Table 6**’. The main components of the model are as followed:

- Seven steps that are reiterative rather than linear: (1) state the problem, (2) define the context, (3) search the evidence and examine the local data, (4) examine current strategies, (5) project the outcomes, (6) evaluation and (7) make conclusions on the value of local strategies and provide recommendations. The definitions and terms of the framework are based on Bardach’s and Collins’ frameworks, as well as NICE guidelines.
- The analysis criteria are generated from NICE guidelines that made up the characteristics of the framework
- Use of a wide range of primary and secondary evidence (including published literature, epidemiologic data and clinical evidence)
- Focus on prevention and lifestyle modification strategies at a local population level, as well as treatment strategies

Table 6: The characteristics of Imperial College Obesity Strategy Assessment Framework (IC-OSAF)

STEP	CHARACTERISTICS
1) State the problem	States national trends and prevalence of obesity; prevalence of obesity & health impact of obesity in PCT
2) Define the context	Describe the profile of the PCT: background information and determinants of health problems (including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators)
3) Identify local data & evidence used (then examine where necessary)	Does the PCT use information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data? yes/no Tick the source of publications use (if relevant): <ol style="list-style-type: none"> 1. NICE guidelines (39) 2. GP data (local & national) 3. UK National Statistics 4. Public Health Report 5. National policy guidelines
4) Examine current strategies	a) What Management strategies are available (based on NICE). Please circle your answer for each item. NHS: <ol style="list-style-type: none"> 1) develop/implement local obesity strategies 2) specific training 3) develop/implement well-being programmes 4) conduct HIAs
	b) What services are available (based on NICE). Please tick your answer. NHS: <ul style="list-style-type: none"> • primary care • community care • secondary care • tertiary care <p>Does PCT has local authorities and partners in the community services? YES /NO (Tick the answer for the following)</p> <ul style="list-style-type: none"> • early years settings • schools • workplaces • self-help programme • commercial programme • community programme <p><u>Clinical/ Treatment Pathways</u> Children: <ul style="list-style-type: none"> • Assessment • Measurements • referral to specialist • counselling • Lifestyle (Tick related intervention: Behavioural/ Diet/PA/Family) • Drug treatment (not for children younger than 12 years, except under specialist paediatric settings) • Follow up </p> <p>Adult: <ul style="list-style-type: none"> • Assessment • Measurement • referral to specialist care • counselling • Lifestyle (Tick related interventions: Behavioural/ Diet/PA/Family) • Drug treatment • Follow up </p>

STEP	CHARACTERISTICS
	c) Does PCT has Non-NHS public programmes? yes /no
	d) Does PCT consider different services and aspects (epidemiological, clinical and economic) for interventions? yes /no (Give details if applicable)
	e) Do services reflect the ethnic and socio-economic diversity of the PCT? yes /no (Give details if applicable)
	f) Compare services against the evidence. Do the services offered by PCT have evidence to show they are likely to be effective? yes /no (Give details if applicable)
5) Define the outcomes	<p>a) Are the key outcome indicators for interventions defined? yes /no</p> <p>Short-term: - proportion for an increase of awareness (health benefits on healthy diet, PA & maintaining of healthy weight)</p> <p>Intermediate/long term: reduce proportion in the population on: - overweight and obesity - reduce morbidities and mortalities - dietary change - PA uptake - risk factors</p>
	b) Are the projected outcomes based on NICE guidelines? yes /no
	c) What interventions are implemented by PCT?
	d) Any other alternative interventions considered? yes /no (Give details if applicable)
	e) Is there evidence from the literature supporting the interventions/outcomes stated? yes /no
6) Evaluation	What plans does the PCT have (if any) to evaluate obesity interventions?
7) Make conclusions	a) Could a PCT's policy be improved? If so, how?
about the value	b) Are there PCTs that are examples of good practice?
of local policies	c) What could be done to improve the evaluation of local policies?

Pilot study: application of IC-OSAF for analysing Hammersmith and Fulham PCT's obesity strategies

Having developed the IC-OSAF, the next stage was to pilot this framework on the obesity strategy of one PCT. The recruitment process started with identifying the PCTs in NWL and consequently sending an invitation letter for the study to all eight PCTs in NWL. The PCTs were contacted via phones and emails as follow-up. Most of the PCTs (5) responded to the invitation letter and sent their obesity strategies to primary investigator within the given period or later. The other three PCTs did not respond to the letter and invitation upon follow up. The PCTs are Westminster, Brent, Harrow, Hillingdon, Hounslow and Hammersmith and Fulham (H&F). H&F PCT was selected to pilot the IC-OSAF, as this is the investigators' local PCT.

The H&F PCT obesity strategy was examined using IC-OSAF as shown in '**Table 6**' ('The characteristics of Imperial College Obesity Strategy Assessment Framework') above and two assessors (AT & SQ) extracted information from the 'H&F PCT obesity strategy report'. Any discrepancies were resolved by consensus, or by consultation with an expert (AM). The main purpose of this method was to minimise assessor bias on the results.

Validation

The result of this process was a narrative review on the content of the H&F PCT's obesity strategy and validation was done by two experts (AM & WD). Validity refers to accuracy, relevance, and reliability of measurement in quantitative research. In this study, the validation process intended to understand, represent or explain a fairly complex phenomenon (and in this case obesity strategy implemented in the H&F PCT). The purpose was to assess when an account was valid and accurately represent those features of the phenomena that investigators intended to describe, explain or theorise. In another words, this method established evidence and confidence that the account has an accurate representation to the real world (127, 128). Therefore, the main purpose of the validation method was to assess content of IC-OSAF and accuracy of the results when applying IC-OSAF as tool in analyzing the H&F PCT's obesity

strategy. The feedbacks from the two experts through the validation process were incorporated into the narrative review and used to fine-tune the IC-OSAF.

4.3. Results of narrative review of the H&F PCT's obesity strategy

The narrative review of H&F PCT's obesity strategy covered key themes including policy context, current strategies available, management and services implemented as well as policy outcomes.

Policy context

Identifying the level of obesity and the broad range of factors that influence its prevalence in H&F was vital to putting the problem into context. The H&F PCT Obesity Strategy contained adequate statistics of childhood obesity, derived from the National Child Measurement Programme (NCMP). This had the advantage that direct comparisons can be made between H&F PCT and London-wide/national results. There was a lack of information on local obesity prevalence. In addition to current figures, using statistical methods to project future prevalence and trends of obesity in the PCT would also aid in highlighting the potential magnitude of the problem. There was no information included in the report to demonstrate the health impact of obesity in H&F. Finally, IC-OSAF identified that there were differing levels of obesity in the various ethnic groups within H&F PCT.

Current strategies

The H&F PCT's obesity strategy demonstrated a multidisciplinary approach in tackling obesity and the current strategies can be divided into preventing obesity (by promoting healthy eating behaviours and encouraging PA) and treating obesity (adult and child care pathways). The main weakness that IC-OSAF had identified in H&F's obesity strategies was that it failed to declare the specific methods that were utilised to execute the strategies.

Management strategies

The management strategies clearly reported in H&F's 'Obesity strategy' indicating that additional training was required to implement the proposed obesity strategy effectively. Although broad training needs within the child obesity care pathway was identified, no specific needs assessment was performed. There was no specific training needs identified within the adult obesity care pathway. These were required across the multidisciplinary team due to the likely increase in subjects entering the pathways, as identification of obese individuals improved.

Services

There was an apparent indication that the existing obesity strategies were implemented via primary and secondary care. Tertiary care services should also be included if available. Other than for some work with schools, the report did not demonstrate that the PCT had the local authority and community services as partners. The strategies may be unsuccessful if they failed to have sufficient impact because they did not offer the range and depth of interventions needed. Although self-help and community initiatives were available in H&F, no mention of these was implemented in the Hammersmith & Fulham Trust obesity strategy report e.g. Fit for Life is a 13-week weight management programme consisting of nutrition education, behaviour change therapy and PA. It was reported that Community nutrition project worked with community groups to improve knowledge of food and nutrition along with practical skills like cooking and shopping (129). Although the child obesity care pathway aimed at children between 7-13 years old only, no future plans to prevent, identify and target obesity at an earlier stage were included.

Non-NHS Public programmes

There were no non-NHS programmes described in the 'Hammersmith & Fulham Trust obesity strategy report'. These services were highly recommended by NICE guidelines (39).

Other strategy use

Although the ‘Hammersmith & Fulham PCT obesity strategy report’ had acknowledged the ethnic and socio-economic diversity of the PCT, it was unclear if these had been considered in the services. This was compounded by the fact that the specific methods and programmes to tackle obesity were included. The likely costs (including breakdown) involved in implementing the adult and child obesity care pathways were clearly delineated. The report also appropriately recognised that the obesity pathways need to be aligned with other care pathways, for example for cardiovascular disease to avoid confusion and duplication. This would ultimately also had a cost benefit.

Use of evidence

H&F PCT’s obesity strategy was based on guidelines from local and national published data, including NICE guidelines, Department of Health publications, such as: ‘Healthy Weight, Healthy Lives: a tool kit for developing local strategies 2008, primary care data’, UK National Statistics, and national policy guidelines, such as the Foresight Report 2007. However, the amount of published data and evidence incorporated into the ‘Hammersmith & Fulham Trust obesity strategy report’ was very limited. Furthermore, there was no evidence included to support the effectiveness of combating obesity specifically by dietary and PA interventions. The report would benefit from including supportive statements from recent medical literature.

Policy outcomes

General outcomes had been suggested, such as targets to reduce obesity in Year 6 children to levels seen in 2000 by 2020, and a reduction of premature mortality for cardiovascular disease and cancer, but the report did not specify the exact targets expected to be achieved.

Both short and long-term outcomes were included in the report but the intermediate outcomes were not stated. The report did not allude to the achievability of the aims, e.g. did the PCT have personnel with the required skill-sets, enough resources, and management support? The smaller time-specific deliverables within the strategy should be stated to ensure timely progress. This was important as the need for short-term action and impact must be balanced against the drive for longer-term sustainable change. Furthermore, stating an estimated endpoint added an appropriate sense of urgency and ensured that the objectives did not extend over an unreasonably long timescale. Once objectives had been achieved, the policy objective can extend to maintaining results. (130).

Crucially, the need for evaluation was identified in the report. The practicalities of the strategy would be evaluated in a few general practices before widespread implementation. This would improve efficacy in terms of final outcomes and costs. However, the report did not include information on using systematic data collection methods and building in a robust evaluation process of the outcomes; this was vital to ensure ongoing refinement of the policy. Furthermore, the report should contained details of when, how, and by whom this evaluation was conducted.

Summary of findings

This study found that H&F PCT's obesity strategy had significant limitations and omissions of the strategies implemented at PCT level. Firstly, in the policy context there was lack of information on local obesity prevalence, health impact and comprehensive profile of the PCT reported in H&F's 'obesity strategy'. Secondly, the existing obesity strategies were implemented via primary and secondary care and there was no indication that the PCT had implemented tertiary care. There was insufficient information reported on the local authority and community services as partners, except for some work with schools. Thirdly, the 'Hammersmith & Fulham PCT obesity strategy report' had acknowledged the ethnic and socio-economic diversity of the PCT, but it was unclear if these had been considered in the services. The likely costs (including breakdown) involved in implementing the adult and

child obesity care pathways were clearly delineated. The report also appropriately recognised that the obesity pathways need to be aligned with other care pathways, for example for cardiovascular disease to avoid confusion and duplication. This would ultimately also have a cost benefit. The main weakness of the 'obesity strategy' was failure to declare the specific methods utilised to execute these strategies when describing the policy outcomes. The above limitations and omissions in the PCT obesity prevention and management strategy contributed to variations in obesity management between PCTs. Two experts (AM & WD) validated the analysis tool (IC-OSAF) and the narrative review for H&F PCT. Overall, the IC-OSAF can be considered as a practical tool used to analyse the content of obesity strategies implemented at community level (PCT), which had advantages over other frameworks. It is a quick assessment tool and less resource intensive for policy analysts or policy makers.

Recommendations

The policy could be improved by considering the following points:

- Need to clearly define the problem and its significance in H&F.
- Baseline statistics, such as the prevalence of obesity and obesity-related illnesses in H&F need to be included in addition to national statistics.
- Additional information was required on the relationship between obesity and demographic variables specific to H&F. The PCT's strategies should reflect the ethnic and socioeconomic diversity of its patients.
- Specific training needs should be identified to efficiently implement new strategies.
- The PCT should consider providing channels for patients to access the adult obesity pathway, e.g. devising strategies to address obesity in workplaces, or via self-help, commercial, and community programmes. The PCT should also include non-NHS public programmes, if available.
- The report should include more details of the exact methods the PCT would use to achieve its strategy.
- The proposed strategies should be evidence-based and the report should demonstrate this with evidence from up-to-date literature.

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- Specific, measurable targets/outcomes need to be decided on and clearly stated in the report. Including intermediate targets would create a step-wise progression towards achieving the overall aim.
 - An evaluation process should be agreed on, as well as when this would be performed.

Lessons learned from the pilot study

The results of the analysis highlighted important shortcomings in ‘Hammersmith & Fulham Trust obesity strategy report’. In this study, I determined several lessons learned in applying IC-OSAF to assess strategies presented in the given report, specifically related to policy content, methods and the tool used (IC-OSAF).

Policy content

For policy content, the accuracy of information presented in each domain of IC-OSAF was considered appropriate according to the two experts (AM & WD) although the key issue raised was the ‘true prevalence’ of overweight and obesity particularly among the ethnic groups and services implemented in the PCT were not adequately stated in the ‘H&F PCT’s obesity strategy report’. This issue was indicated as one of the main limitations of the pilot study. As mentioned above, there was lack of information on local obesity prevalence, health impact and comprehensive profile of the PCT reported in the ‘Hammersmith & Fulham Trust obesity strategy report’. Therefore, I had difficulty in determining the ‘true prevalence’ and health impact of obesity in adults and children, particularly among different ethnic groups in the PCT when analysing the report. As suggested by the experts (AM & WD), additional information on the relationship between obesity and other demographic variables, such as income, disabilities and employment status were crucial to understand the scope of obesity in the H&F PCT. In addition, the strategy may benefit from including data on the size of the obese population being served in H&F, as this was critical for effective planning. The health impact of obesity in H&F was not clearly demonstrated, for example, type 2 diabetes, stroke and CHD can all arise as a consequence of obesity and could be included and then compared

to national averages. A comprehensive profile of the PCT would put health policy into context and enable understanding of the specific socio-cultural determinants of obesity in the PCT. This would create a shared understanding of the relationship between key factors influencing the levels of obesity and their relative importance.

Current strategies

Although, the report indicated various current strategies and services for prevention and management of obesity were implemented at primary care, secondary care and community levels in the PCT, it was not clearly mentioned on the specific methods utilised to implement those strategies and services. Therefore, I was not able to determine effective implementation of the strategies and services in the PCT based from the data presented in the report alone. There was missing information when examining the report following each domain of IC-OSAF, for example use of local published data and evidence in policies, non-NHS public programmes as well as evaluation plan. I utilized data from various sources including online reports and reports submitted by the H&F PCT in order to address each domain of the IC-OSAF. The experts (AM & WD) argued that the strategies and services reported might not accurately reflect the actual situation in the H&F PCT. Therefore, the relevant missing information must be sought from the obesity programme coordinator in H&F PCT, where necessary.

Methods

The key issues highlighted by experts (AM & WD) pertaining to the tool were lack of clear instructions and rigid criteria included for three domains ('examine current strategies', 'define the outcomes' and 'evaluation') and quality assessment criteria. I made refinements on the tool improving the clarity and applicability of the framework, mainly for stage four (examine current strategies), five (define the outcomes) and six (evaluation). In stage four, the criteria were simplified and redesigned as a checklist with closed answer options to make it more practical and less time consuming to complete. For stage five, the outcomes were no longer prescribed, so as to avoid limited responses and a checklist with closed answer options

were included for the same reasons stated above. In stage six, the evaluation criteria were specified by including items such as time frame, methods and cost. IC-OSAF was also lacking quality assessment component that enable assessors to make an objective judgment on the quality of the ‘Hammersmith & Fulham Trust obesity strategy report’. Thus, the framework was further fine-tuned to better assess obesity strategies for other PCTs. At this stage, I found that IC-OSAF was modified into a practical tool used to analyse the content of obesity strategies implemented at community level (PCT), which has advantages over other frameworks.

This work was published in peer-reviewed journal named ‘Primary health care research and development’ in April 2011, volume 12, issue 2 and pages 83 to 94. The title of the article was ‘Development and application of the IC-OSAF for analysing local obesity strategies’.

4.4. Comparative study: policy analysis of obesity strategy using IC-OSAF for Primary Care Trusts in North-West London

As discussed above, the framework had shown to be beneficial in highlighting deficiencies in local strategies, as indicated in the results for H&F PCT’s obesity strategies analysis.

Although, reviewing obesity strategies documents for PCTs in NWL England had shown that all PCTs reported having obesity strategies for adults, teenagers (13-19 years) and children (below 12 years). However, there was no evidence showing the obesity strategies implemented by PCTs were meeting the criteria in NICE guidelines, as well as any potential variations reported. There were no up-to-date policy evaluation studies examining the content of local obesity strategies across PCTs. The main purpose of this study was to assess the obesity strategies implemented at four PCTs in NW London using modified IC-OSAF and evaluate if the policies were meeting the criteria for NICE guidelines. Furthermore, the analysis findings were summarised and compared across the PCTs to identify similarities and any potential variations.

Methods

In this study, the additional methods undertaken were modifications of IC-OSAF following the pilot study; data extraction and analysis using modified IC-OSAF, quality assessments of each PCT's obesity strategy report and validation of IC-OSAF and the results using an expert consultations approach.

Modifications of IC-OSAF

From the lessons learned in the pilot study, I fine-tuned IC-OSAF further by integrating two components of quality assessment tool into the framework, i.e. generating subjective and objective measures. The steps in developing the quality assessment tool were checked by an expert (AM). Two assessors (AT and SQ) independently conducted the assessment and any discrepancies were resolved through discussion or by a third assessor (AM).

The three categorical subjective measures used are **'yes'** (most information is stated); **'unclear'** (unable to make judgment due to lack of information stated); and **'no'** (inadequate or no information is stated) to evaluate the depth of information extracted. It refers to a reviewer's judgments on the completeness of information reported using the characteristics of IC-OSAF. A scoring system tool is the main objective measure used to quantify the quality of the policy. The tool consists of seven main items with a maximum total score of 50. The main items correspond to the seven steps of IC-OSAF and each is given a score. The weighting of the score is based on the importance of each main item within the assessment framework and derived from the characteristics included. Scores are also allocated to the characteristics. The 'scoring' was completed independently by two assessors. Higher scores reflected better policy quality. The cut-off points are categorised as 'high' (total scores between 35 and 50); 'adequate' (total scores between 26 and 34); and 'low' (total scores between 0 and 25). The primary purpose of the tool is to provide a quantitative value for each policy and enable assessors to make an objective judgment on the quality of the respective policies.

Data extraction and analysis

Two assessors (AT and SQ) independently extracted the data using criteria or characteristics of modified IC-OSAF (as shown in ‘**Appendix 12**’, ‘The modified IC-OSAF assessment tool’) and applied it for each PCT’s obesity strategy report. Any disagreements were resolved by discussion, or, when required, by a third assessor (AM). Where necessary, I sought any relevant missing information on policies from the obesity programme coordinator in each PCT. Then, themes were identified and generated when analysing the extracted information across four PCTs’ obesity strategy report.

Validation

In the validation process, experts were invited from the four PCTs (Brent, Hounslow, Hillingdon and Westminster) using emails and documents (which consisted of participant’s information sheet, validation questionnaire, modified IC-OSAF and summary of narrative review scripts for each PCT) were attached to the emails. The validation questions posed to the experts were as followed (and shown in ‘**Appendix 14**’, ‘validation questionnaire for PCTS in north west london’): 1) the appropriateness of constructs or domain IC-OSAF; 2) accuracy of the information presented in the results for each domain; 3) representative or adequate coverage of the data included in each domain; 4) quality assessment criteria for each domain of IC-OSAF is appropriate; 5) limitations of the IC-OSAF; and 6) feedback for improvement.

One expert submitted the completed questionnaire through email upon agreement to participate in the project. The validation questionnaire filled in by the expert was given a code to protect anonymity of respondent. The information was kept in password-protected laptop, and only primary investigator had accessed to it. The procedures were put in place to ensure the participants’ confidentiality and safety of the data. The feedback given by the expert was incorporated into the narrative review and used to fine-tune the IC-OSAF.

Results of narrative review of four PCTs

The descriptions of the analysis of obesity strategies using modified IC-OSAF for four included PCTs were shown in the ‘analysis of obesity strategies for included PCTs’ (**Appendix 13**), ‘summary of analysis result for PCTs in NWL’ (**Appendix 15**), and ‘quality assessment summary of obesity policies’ for included PCTs’ (**Appendix 16**).

Policy context

The problem of obesity was clearly described in the ‘Obesity Strategy’ of three PCTs (Brent, Hounslow and Hillingdon) but not for one PCT (Westminster). The Brent PCT ‘Obesity Strategy’ contained adequate statistics of childhood obesity at national and local levels, but statistics for adult obesity were not stated. The Hounslow PCT ‘Obesity Strategy’ included national and local statistics of adult obesity, whilst the PCT prevalence was given for year 6 and reception children only. For Hillingdon PCT, the national obesity trend and projected prevalence for adults were stated, but there was no statistic reported at local level. The local obesity prevalence amongst children in year 6 and reception year were included. The statistics for national trends and prevalence of obesity for adults were not stated in the Westminster PCT ‘Obesity Strategy’, except only for figures for children aged 2 to 10 years at the PCT. Overall, adult and childhood obesity were reported as a major public health problem in all included PCTs. However, there was lack of information provided in defining the problem (in particular the local obesity prevalence) in all PCTs.

Three PCTs (Brent, Hounslow and Westminster) had reported the health impacts of obesity in their ‘Obesity Strategy’, whilst one PCT (Hillingdon) had not mentioned it. The health impacts of childhood obesity were described as the resulting reduction in cancers, cardiovascular disease, stroke and type2 diabetes, according to Brent PCT. There was recognition of the impact of obesity in Hounslow and ‘CHD’ was named as the second biggest killer. Diabetes type II, gall bladder disease, CHD, hypertension and cancers were amongst the major health impacts of obesity in Westminster PCT. There was no information

included in the report to demonstrate the health impact of obesity in the ‘Obesity Strategy’ for Hillingdon PCT.

A comprehensive profile of the PCT was only reported by one PCT (Brent), whereas the rest of the PCTs (Hounslow, Hillingdon and Westminster) had given limited information. The ‘Obesity Strategy’ for Brent includes a wide range of information on the ethnicity, age structure, and rates of employment and deprivation scores, with note being made of significant differences in mortality and morbidity between the south and north of the borough. Meanwhile, there was limited information given on the profile of the Hounslow PCT, particularly in terms of demographics (e.g. total population, gender proportions etc.); whereas others are stated (socio-economic profile, ethnicity, health, morbidity & mortality indicators). There was socio economic information on obesity amongst children that was mapped against deprivation in the borough. There was no local ethnicity data given, although the national data was provided. The morbidity and mortality indicators were addressed by CHD admissions and deaths. Similarly, there was limited information on ethnicity, age, morbidity or mortality data for the Hillingdon PCT (Hillingdon). For Westminster PCT, some background information and determinants of health problems for the PCT were provided (e.g. ethnicity and risk of obesity, morbidity, cost of treating obesity), but other information was not given and needs to be considered (e.g. demographic, socio-economic profile, health and mortality indicators).

Current strategies

In tackling obesity, a multi-focused approach was necessary and the measures must encompass population level and targeted interventions aimed at individuals. According to NICE guidelines, the recommended strategies include management, services, treatment pathways, local partnerships, non-NHS public programmes and considerations of different aspects as stated in IC-OSAF (39). All included PCTs had reported planning or implementing the recommended strategies.

Management strategies

The management strategies indicated include: development and implementation of local obesity strategies (such as 'Brent Health' and Hillingdon PCT 'MEND' programmes); training conducted for frontline staff and parents or child-minders in particular for Brent ('Food in Schools'), Hounslow and Hillingdon PCTs ('MEND' and 'Green Spaces' programmes); as well as implementation of well-being programmes in all the included PCTs for example 'family information service' (FIS) and 'breastfeeding' programmes in Hillingdon and 'Westminster children and young people's plan' initiatives. Only Westminster PCT conducted a HIA. There was limited information given to assess availability of management services in the 'Obesity Strategy' of Westminster PCT.

Services

The most common services available in all included PCTs were primary care and community care. In Brent PCT, GPs were involved in the recording of BMI status and the main focus was on community based approach using school nurses, dieticians and health visitors. Secondary and tertiary care was not discussed in the 'Obesity Strategy'. In Hounslow PCT, the services (primary care and community) were mainly offered by health professionals (e.g. GPs, dieticians, public health nurses, school nurses and health visitors). The secondary care services were delivered at the local hospital by health professionals (e.g. hospital midwives and endocrinologists). There was no information stated on tertiary care. For Hillingdon PCT, there were few community services offered by dieticians ('FIS' programme), school nurses ('NCMP') and health visitors/midwives ('Breastfeeding' initiatives). There were also few secondary care services offered including the 'exercise referral scheme' run by the local cardiac unit. There was no information available for primary or tertiary care services. In Westminster PCT, there were few primary care services provided by health care professionals, such as by health visitors (for 'breast feeding' and 'infant feeding' programmes); 'Sure-start' units and 'children's centres' (for young children); and nurse practitioners (offering weight advices to children and families). The community service offered is mainly community dietetic counselling (e.g. in 'Fit for life programme' and 'Drop into weight' programme) and there were no other details given. The tertiary services were offered through the 'auspices of the LAA' for overweight/obese children and their family.

The included PCTs all reported having local authorities as partners in their community services mainly for early year settings and schools. Brent PCT implemented breastfeeding initiatives (early years setting) and in local schools the 'MEND' as well as 'Healthy Food Schools' programmes were implemented. There was no information provided for workplaces, self-help and commercial programmes. Meanwhile, the Hounslow PCT had breastfeeding initiatives carried out by postnatal staff and the 'FIS' programme at the preschool settings. Schools had the 'FIS' and 'NCMP' initiatives. For workplaces, several initiatives were available, including nutritional standards (in the NHS, Ministry Of Defence and the Prison service) and 'green transport schemes'. There was limited information available on self-help and commercial programmes implemented in the PCT. For Hillingdon PCT, the local partnership was indicated at the early years setting for example the 'Sure-start scheme' and 'breastfeeding initiatives'. The 'MEND' and 'FIS' programmes were implemented in partnership with local schools. In workplace settings, there was agreement to introduce 'healthy food' and 'cycle' schemes for council employees. Self-help and commercial programmes were not mentioned in the 'Obesity Strategy'. Meanwhile, the Westminster PCT focussed on 'breastfeeding' and 'weaning' programmes (particularly in the deprived communities) at early years settings, although there was no information stated about specific programmes. The PCT-school partnership support various programmes including: the 'Healthy schools programmes'; 'Westminster School Sports Partnership' (development of physical education within the curriculum and outside of school hours); and 'Westminster school meals' (i.e. revision of service specification to ensure a nutritious school meal service). There was no detail given on self-help and commercial programmes.

The obesity clinical or treatment pathways varied between the included PCTs. According to the 'Obesity Strategy' for Brent PCT, the clinical/treatment pathways of childhood obesity were tackled with measurement, assessment and lifestyle measures, but there were no mention of adult treatment pathways. There was limited information given on clinical/treatment pathways amongst adult and children for Hounslow PCT. For children, the assessment and measurements were obtained through the 'NCMP' and other lifestyle programmes (such as 'FIS' and PA programmes), whereas there was no mention of specialist referral, counselling, or drug treatment and follow up within the pathways. Similarly, the 'Obesity Strategy' for Hillingdon also reported the clinical/treatment pathways for children

only using the same measures (gathered from ‘NCMP’, ‘FIS’ and ‘MEND’ programmes) and the pathway did not include specialist referral, counselling and drug treatment. The adult pathways primarily focussed on lifestyle approaches (e.g. increasing PA), but other specific components of the pathway were not mentioned (e.g. measurement, assessment, drug treatment and behavioural interventions). Westminster PCT did not report adequate indication about the implementation of adult clinical/treatment pathways, although the ‘obesity treatment care pathway for children and young people’ was clearly proposed in the ‘Obesity Strategy’.

Non-NHS public programmes

Three PCTs (Brent, Hounslow and Hillingdon) had reported having non-NHS public health programmes, whereas one PCT (Westminster) did not clearly explain it. The programme introduced in Brent PCT is the ‘5-a-day’ initiative (uses GIS mapping and works with retailers and the schools). Likewise, the programme was also available in Hounslow PCT. There were limited non-NHS public programmes reported in Hillingdon PCT (e.g. the cycling training programmes).

Other strategy use

Although, the included PCTs had reported using various methods in planning and implementing their interventions like epidemiological (e.g. obesity prevalence and health impacts of obesity); clinical (e.g. GP and secondary services); and economic (such as PCT operating cost in a year), however there was only limited information given. The ethnic and socio-economic diversity of the PCT was reflected by services that target specific groups in three PCTs (Brent, Hounslow and Westminster), and not discussed in one PCT (Hillingdon). The targeted groups in particular were vulnerable groups at risk of obesity particularly people from different ethnics background and people with disabilities. There was no data reported on social economic status.

Use of evidence

The included PCTs had used information from various local and national published data, whilst their use of evidence from the literature in supporting the interventions and outcomes was very limited. For instance, the Brent PCT ‘Obesity Strategy’ used NICE guidelines, National Heart Forum guidance, DCFS government reports and GP data. Evidence from literature was used to support interventions (e.g. the ‘MEND’ programme). For Hounslow PCT, NICE guidance, GP QOF data, national UK statistics (HSE), public health reports and national policy guidelines have all contributed to the policy. There was limited use of evidence from the literature included. The Hillingdon PCT ‘Obesity Strategy’ used information from various sources (e.g. NICE guidelines, UK national statistics, local public health reports and national policy guidelines) but GP data was not used. Meanwhile, the Westminster PCT included only NICE guidelines, GP local data and national policy guidelines (e.g. National Audit Office Report, Foresight Report) in the policy. Other sources of information (e.g. National GP data and UK National statistics) and evidence from the literature were not used.

Policy outcomes

The policy outcomes assessed consist of key outcome indicators, projected outcomes and availability of interventions reported in the ‘Obesity Strategy’ of the PCT. The four PCTs provided adequate information on the given measures.

Brent PCT includes the short term and medium term key outcomes for the ‘MEND’ programme, but these were not well defined. The projected outcomes claimed to be based on NICE guidelines, although there was limited information given. There were few interventions implemented that include ‘MEND’ and ‘FIS’ programmes. The alternative interventions were not clearly specified, except for the PCT plan to redirect the available resources to primary care and community prevention.

For Hounslow PCT, there were only long-term key outcomes indicators stated (e.g. 5 hours of PA a week for children and target reductions in childhood obesity), whilst the short term and intermediate key outcomes were not defined. There was a need to formulate short term and intermediate outcome indicators that were very specific with given time frames. The projected outcomes stated were based on NICE guidance, but no details were included. There was wide range of interventions highlighted by the PCT, but only limited information was provided. The alternative interventions considered were the ‘green transport’ programme and ‘cycle schemes’.

The ‘Obesity Strategy’ for Hillingdon PCT includes short term key outcome indicators, specifically for the ‘MEND’ programme (e.g. BMI and heart rate); and the long-term outcomes (such as 5 hours of physical education for 5-16 year olds after three years). The immediate outcome indicators were not discussed and there was limited information given for other programmes. The outcomes were based on NICE guidelines, though there was little detail provided. There were various interventions implemented by the PCT including ‘MEND’, ‘breastfeeding’ and ‘FIS’ programmes. There were few alternative interventions considered (e.g. the provision of quality food and physical education space into the building schools and management of fast food outlets near schools) for future programmes.

Finally, the Westminster PCT had reported more long-term key outcome indicators (such as ‘to implement an evidence-based multi-agency prevention and health promotion programmes’) than the short-term outcomes (e.g. to halt the year on year rise in overweight and obesity levels for children), whilst there was no intermediate outcome stated. The projected outcomes for the proposed obesity treatment care pathway for children and adults were based on NICE guidelines, but more details were needed. There was a range of obesity prevention interventions implemented, which include: ‘The Healthier Westminster’, ‘Fit for life’ and ‘Mind the Gaps’ programmes. The alternative interventions included the obesity treatment care pathway, prevention programmes for vulnerable groups and neighbourhood-level action. These interventions were not explained. The key outcome indicators must be specifically defined, measurable and time frames indicated. The relevant short-term outcomes were useful to be included, so that impacts can be measured over a shorter time frame.

Evaluation

The evaluation strategies reported by the included PCTs were very limited. For instance, Brent PCT reported the plan to evaluate 'MEND' programme, but no specific information about methods was provided. Hounslow PCT reported a plan to audit the '5 hours of PE a week' initiative for children and used this to identify gaps and targets as appropriate. The statements for evaluation were stated, but no further details on process of evaluation were given. There was an intention to evaluate the 'MEND' programme for Hillingdon PCT. The 'Obesity Strategy' for Westminster PCT also did not indicate strategies to evaluate the interventions.

Quality of policies

The quality assessment of the policies for all PCTs was described in the 'summary of analysis result for PCTs in NWL' (**Appendix 15**) and the 'quality assessment summary of strategies for PCTs in NWL' (**Appendix 16**).

The majority of the 'Obesity Strategies' developed or implemented by the included PCTs (Hounslow, Hillingdon and Westminster) were graded as 'adequate', whereas there was only one graded 'high' (Brent PCT). The scoring values of the included PCTs range between 26 to 38; and Brent PCT obtained the highest total scores (38) whereas Westminster PCT had the lowest (26). Higher scores reflected better policy quality.

Step 1: statement of the problem

Three (75%) PCTs (Brent, Hounslow and Hillingdon) had stated most data in 'statement of the problem' (step 1) and graded 'yes' and only one (25%) PCT (Westminster) was graded 'unclear'. The scores obtained by all PCTs were minimal (1 to 2).

Step 2: define context

All PCTs (100%) had reported most information in ‘define context’ (step 2) and graded ‘yes’, but the score obtained by Brent PCT (2) was higher than the other PCTs (1).

Step 3: identify local data and evidence used

The included PCTs (100%) had included most information in ‘identify local data and evidence used’ (step 3) and all graded ‘yes’. However, only two PCTs (Brent and Hounslow) had attained the maximum scores (2).

Step 4: examine current strategies

All PCTs (100%) had provided required data for the item ‘examine current strategies’ (step 4) and graded ‘yes’. Brent PCT obtained the highest score (19) and Westminster PCT had the lowest (13); whereas the other PCTs (Hounslow and Hillingdon) had a similar score (14).

Step 5: define outcomes

Four PCTs (100%) had defined the outcomes (step 5) in their respective policies, and all were graded ‘yes’. Nevertheless, Brent PCT had the highest score (10) and Westminster PCT had the lowest (6). Hounslow and Hillingdon PCTs received scores of 7 and 9 respectively.

Step 6: Evaluation

Three (75%) PCTs (Brent, Hounslow and Hillingdon) had mentioned appropriate strategies in the ‘evaluation’ (step 6), thus graded ‘yes’ and got the same score (2). Only one (25%) PCT (Westminster) was graded ‘unclear’ with minimal score (1).

Validation feedback

The expert had responded 'YES' to question one to four and 'NO' for questions five and six. Each construct for IC-OSAF was considered robust, as information presented in the narrative review of four PCTs was fairly accurate and appropriate to England. The quality assessment criteria were considered appropriate for each included PCT. The categorical subjective measures used (yes/unclear/no) indicated appropriate depth and coverage of information for each domain of IC-OSAF in all PCTs. Meanwhile, the scoring system was found to have few advantages such as objective quality measurement tool for each policy, useful instrument for comparing quality of obesity strategy reported in each PCT, and allowed PCTs to be ranked. There was no significant limitation for IC-OSAF used as assessment tool at local level and therefore no further refinement was suggested.

Summary of findings

In this study, one of the major findings was all included PCTs reported adult and childhood obesity as a major public health problem, but the problem was not clearly defined across the policies because there was lack of information reported (in particular on the use of local obesity statistics, e.g. prevalence and trends). All PCTs failed to provide a comprehensive profile (e.g. demographic, socio-economic profile, health and mortality indicators) in each 'obesity strategy report'. The PCTs had reported planning or implementing the NICE guidelines recommended strategies (such as management strategies, services available and non-NHS public programmes). The strategy that was not widely reported in the policies of included PCTs was HIA, where only one PCT has conducted such an assessment. Meanwhile, the main services available in all included PCTs were primary care and community care, but the services for secondary care and tertiary care vary across the PCTs. The included PCTs all reported having local authorities and partners in their community services, however there was limited information provided for self-help and commercial programmes. Although, the clinical or treatment pathways for obesity management are implemented in the all included PCTs, but the pathways varied and may not completely meeting the criteria prescribed in the national guidelines. The main weakness found was a lack of short-term and intermediate outcome indicators stated in their respective policies that may impact upon the effectiveness of current interventions. The evaluation strategies were

not explicitly reported by the included PCTs. There were significant variations in obesity management between PCTs. There was only one PCT (Brent) graded as having a ‘high quality’ obesity strategies based on IC-OSAF.

Recommendations

The policies of the included PCTs can be further improved by considering the recommended strategies, as shown in the ‘summary of recommendations for included PCTs’ (**Appendix 17**). For Brent PCT, the primary recommendations were to clearly define the problem; and provide more details on the current services available. The ‘Obesity Strategy’ for Hounslow PCT needed to formulate well-defined strategies for evaluation of the policy. The major recommendations for Hillingdon PCT were to utilise other local statistics available (e.g. GP data) when defining the problem of obesity and to explicitly outline the outcomes.

The key improvements suggested for Westminster PCT were a clearly defined statement of the problem and the development of specific key outcome indicators for interventions.

Lessons learned from the comparative study

From the comparative study, I identified several lessons learned when applying modified IC-OSAF to assess obesity strategy reports across the four PCTs (Brent, Hounslow, Hillingdon and Westminster) specifically related to policy content and methods including the tool used (IC-OSAF). One expert validated the modified IC-OSAF and the narrative review for the four PCTs, and showed high degree of agreement on both the tool used and results presented.

Policy content

The policy content consisted of ‘state problem’ (step 1) and ‘defined context’ (step 2) based on the criteria of IC-OSAF. All PCTs (Brent, Hounslow, Hillingdon and Westminster) had reported relevant information when describing their policy content (including national statistics of adult and childhood obesity, demographic characteristics, morbidity and mortality indicators and health impacts). There was lack of information on local obesity prevalence for

adults and children as well as limited data on comprehensive profile in each PCT (such as ethnicity, gender proportion, age, socioeconomic profile, morbidity and mortality indicators) stated in the ‘Obesity Strategy’ reports. Therefore, I was not able to extensively assess the policy content of all PCTs and determine the scope of obesity problem, determinants of health problems and people at risk in each PCT.

Current strategies

Similarly, all included PCTs had reported planning or implementing the NICE guidelines recommended strategies (such as management strategies, services available and non-NHS public programmes) and various programmes in each PCT: for example, ‘Brent Health’ programme, Hillingdon PCT ‘MEND’ programme and ‘Green Spaces’ programme in Hounslow. I found out that the methods used for each programme were not stated in the respective reports and indicators of effective implementation of those programmes were not reported. It was difficult to assess if the strategies and services in the PCTs were effectively implemented based from the information gathered from the policies due to missing data.

Methods

As mentioned above, there was lack of information and missing data identified during the analysis process that may affect the quality of the narrative review of each PCT. For the methods, I learned that quality assessment was useful tool to make an objective judgement on the quality and quantitative value of policy for each PCT, in particular when making comparison across the included PCTs. It was considered as a rigorous approach built into IC-OSAF and used to analyze the ‘obesity strategy’ of the included PCTs. I also found that the validation process of IC-OSAF and the narrative reviews with expert enable realistic, context-specific and accurate results were presented in this study. The major limitation of the validation method was difficulties in recruiting more experts as PCTs had been dissolved when validation process was carried out, therefore this may potentially affect the findings of this study.

5.0. Lessons learned for Brunei: obesity strategies analysis using Brunei-IC-OSAF

5.1. Background

England's experiences in tackling obesity are possible modalities that can become a benchmark for other countries to strengthen their existing strategies and policies in preventing and managing overweight and obesity. Brunei has a similar burden of the diseases to England, where cancer or malignant neoplasm (18.4%), heart diseases (15.8%), diabetes mellitus (8.5%), cerebrovascular diseases (8.3%) and septicaemia (4.4%) were the top leading causes of death as reported in the 'Health Report 2009' (131). In Brunei, the top five causes of mortality in 2003 to 2007 were related to obesity based on 'Health Report 2007' (132). In 1997, the '1st Brunei National Nutritional Status Survey' (BNNS) showed considerably high obesity prevalence among men (11.2%) and women (12.8%), and in total 45% of men and 44.1% of women are either overweight or obese (133, 134). The preliminary findings from the 'Integrated Health Screening and Health Promotion Programme for Civil Servants' (IHSPPCS) in 2007 to 2009 showed 64.4% of participants were either overweight or obese (134). Overweight and obesity contribute to the risk for many diseases, such as diabetes (44% of obese patients are diabetic), ischaemic heart disease (23%) and certain cancers (7-41%) (1). If the interventions for obesity continue to be ineffective, the prevalence of obesity and its burden of diseases may further increase over the years.

Moreover, obesity has huge economic implications for Brunei from direct treatment costs and indirect costs. Brunei, like many other countries is also experiencing increasing health care costs over the years, particularly due to the increasing burden of NCDs. The health care services offered by MOH are fully funded by the government out of the National Health Budget. The government allocated only 6.96% (\$259 millions) of its national budget on Health in 2007, and it had slightly increased to 7.29 percent (\$286 millions) in 2009. There was also an increase in the total health expenditure from \$294 million (2007) to \$311 million (2009) in these years. In 2009, the per capita health budget was \$706.00, whilst the per capita health expenditure was \$768.00. The difference-patients health expenditure was often added and paid into the MOH's budget allocation through the Ministry of Finance. The details are

shown in ‘summary of government’s health expenditure from 2007 to 2010’ table in **‘Appendix 18’**.

Issues

Brunei has high prevalence of overweight and obesity amongst adults in the population, higher for males than females. The country showed increasing obesity trends and obesity-related disease burden like other countries. Health care expenditure has remained fairly high over the years. The government has emphasised promoting healthy living (by reducing the prevalence of obesity and smoking) as its first priority in the National Health Care Plan 2000-2010 (135). Evidently, obesity is the major risk factor for health impairment and has high economic impact for the country; thus, it has been given the highest priority in the National Health Care agenda. Currently, there is no readily available framework for evaluating obesity strategies at the national level, even though such a framework may be very beneficial in highlighting deficiencies in local strategies.

In this study, IC-OSAF was used to assess the existing strategies that were implemented for the prevention and management of obesity at local (district) and national levels in Brunei, and consequently potential policy issues can be identified for effective implementation of those strategies. The objectives of this work were to:

- a) examine existing strategies related to the prevention and management of obesity implemented at national and local level (districts) in Brunei
- b) modify IC-OSAF to suit the Brunei context for content obesity strategies analysis
- c) apply the Brunei-IC-OSAF to assess the existing obesity strategies
- d) assess the validity of Brunei-IC-OSAF for examining those strategies
- e) generate range of strategies for recommendations.

5.2. Methods

The methods used in the project consist of documentation review of health policies and programmes for prevention and management of obesity that were implemented in the country, modification of IC-OSAF to Brunei-IC-OSAF, data extraction and analysis and validation of the results using experts consultation.

Documentation review of health policies

The development of obesity policies and guidelines in Brunei is strongly driven by WHO health policies statements and directives (including the ‘Ottawa Charter for Health Promotion 1986’, ‘Jakarta Declaration on Leading Health Promotion into the 21st Century 1997’ and ‘Bangkok Charter for Health Promotion 2005’) (134). The call to reduce the prevalence of obesity and promote healthy living has become one of the national key health policy priorities which were mentioned in various government health reports over the years, such as in the National Health Care Plan 2000-2010 (136).

The ‘Vision 2035 Ministry of Health Strategy’ policy

The ‘Vision 2035 Ministry of Health Strategy’ policy has highlighted ‘A Nation that embraces and practices healthy lifestyle’ as one of its key priorities. The strategy focuses on NCDs, tobacco control, oral health, emerging and re-emerging infectious diseases and other preventable risk factors. The aims are to (137):

- promote and empower wellness (including physical and mental health)
- advocate for conducive environmental health
- educate healthy choices through effective communication (make it easier, accessible and affordable)
- promote healthy setting (villages, homes, workplaces and public places)
- promote community participation and inter-sectoral partnership
- promote healthy ageing

The main strategic objectives for the national health promotion priorities are to ensure the effectiveness of health promotion and to educate and support individuals in leading a healthy lifestyle. The key performance indicators (outcomes measured) are the number of health promotion programmes achieving target and customer satisfaction index (knowledge, attitude and practice) (137).

The ‘Health Promotion Blueprint 2011-2015’ policy

The ‘Health Promotion Blueprint (HPB) 2011-2015’ policy focuses on NCDs risk factors in particular obesity, unhealthy diet, physical inactivity and tobacco use. It has four strategic objectives: ‘(1) establishing and strengthening health in all policies across Government, where relevant public policies will need to be strategically aligned and more inclusive of health and well-being outcomes; (2) developing effective quality and innovative health promotion programmes, particularly to address risk factors for NCDs; (3) enhancing inter-sectoral collaboration and partnership between Government agencies, Non-government organisations (NGOs), private sector, civil societies and communities in the implementation of specific initiatives; and (4) developing and enhancing skills and competencies in health promotion’ (pg.7) (134).

The ‘National PA Guidelines for Brunei Darussalam’

The ‘National PA Guidelines for Brunei Darussalam’ policy is aimed to promote healthy lifestyle and reduce the risk of NCDs in the general population. The policy is one of the initiatives formulated in the ‘HPB 2011-2015’. It provides evidence-based information on PA and set recommendations on how to perform PA for different population groups in the country (in particular targeting those individuals at the age of 5 years and older). The guidelines serve to improve health through regular and appropriate PA and enables maximum health benefits to be achieved among individuals (138).

The ‘Strategy Map for Brunei’s Obesity Prevention and Management’

The Health promotion unit (HPU) has outlined the strategy map for Brunei’s Obesity Prevention and Management strategies which can be divided into three phases, and which mainly focuses on strengthening primary, secondary and tertiary interventions, as well as expanding strategic areas and services (like health education programmes, referral protocol and treatment, school health promotion programmes for children and adolescent and establishment of ‘National Obesity Prevention and Management Center’). The details are shown in ‘**Appendix 19**’ (‘The strategy map for Brunei’s obesity prevention and management strategies’) (139). The MOH has no existing comprehensive policy document on obesity prevention and management, but there are various initiatives planned and these have been implemented at different levels (e.g. primary care, secondary and tertiary) in the country.

Documentation review of obesity prevention and management programmes

The prevention and management of obesity in the country is coordinated by the Health Promotion Centre (HPC) Ministry of Health (MOH). The centre is led by a senior medical officer and run by a multidisciplinary team that consists of a community health nurse, Health education officer, psychologist, dietician, community medical officer (GP) and administrative staff. The centre is the leading agency for the coordination and monitoring of initiatives laid out in the ‘HPB 2011-2015’. It is a central hub for all national community-based health promotion and HE activities, and offers range of HE services or activities. The services offered are ‘a Healthy Lifestyle Clinic’ (for weight management), ‘the IHSHPCS’, ‘Health Galleria’, ‘Youth Outreach Programme’, ‘Mukim Sihat’ or ‘Healthy Village’ programme and other healthy lifestyle activities such as HE talks (134, 140). The secondary and tertiary services for obesity management are provided through obesity clinics (at the department of endocrinology) and at the cardiac rehabilitation unit (at the cardiology department) in ‘Raja Isteri Pengiran Anak Saleha’ (RIPAS) Hospital (141). The services are summarised in the ‘obesity prevention and management services in Brunei’ table in ‘**Appendix 20**’

‘Healthy Lifestyle Clinic’ (‘Klinik Cara Hidup Sihat’) Programme

The ‘Healthy Lifestyle Clinic’ (‘Klinik Cara Hidup Sihat or KCHS’) programme was established in 2006, and located at HPC in the Brunei-Muara District in 2007. The clinic is under direct supervision of the HPC MOH and is led by a senior medical officer. The purpose of the programme is to assist clients in reducing their overall body weight by an average of 1-2 kg per month or 5% - 10% weight loss over a period of three months, particularly among overweight adults through lifestyle modification; mainly healthy diet and physical exercise by taking into account of individual’s readiness to change. The target participants are adults with BMI 30 and above. The activities of the programme are conducted twice a week for 10 weeks duration and often run in 4 cycles per year. The interventions are medical consultations and health screening, psychological motivation and encouragement, physical assessment and counselling sessions (including weekly exercise with PA instructor), dietary advice and counselling and healthy eating skills development (142). There has been no formal evaluation carried out to examine the quality of care of the programme since its implementation.

Overweight Clinic Programme (School Health Services)

The school health services within the HPC run several overweight management programmes for primary and secondary school students in the country. The main strategies used are individual counselling, medical screening, dietary group counselling and health talks. The ‘overweight clinic’ programme is a family-based intervention offering individual counselling and medical screening (assessment of BP and glucose levels, particularly for children who are obese) and the aim is to maintain existing weight as the child’s weight will grow into an appropriate weight for their height (143).

Obesity Clinic Programme (RIPAS Hospital)

The obesity clinic offers secondary care services for the management of obesity and is located at RIPAS Hospital in Brunei-Muara district. The purpose is to provide comprehensive weight management services with a multi-disciplinary approach focusing on nutrition and metabolic interventions to promote a client's positive mental and physical health. The main criteria for recruitment into the obesity programme are an individual with BMI more than 30 and aged 18 years or over. The programme runs for six months and has three stages, which comprise of induction programme (stage one), metabolic and fitness assessment (stage two) and obesity management (stage three). The interventions consist of HE, diet and PA assessment, blood tests, anthropometric measurement, drug therapy and bariatric surgery (139).

Cardiac Rehabilitation Programme (RIPAS Hospital)

The Cardiac Rehabilitation Programme (CRP) was established in 2004 and is one of the main national strategies in managing heart diseases at tertiary level in the country, as suggested by the WHO Cardiac Rehabilitation Policy Statements Report in 2003. It is an eight-week programme which consists of 16 HE and physical exercise sessions, with maximum of 10 patients per group. The target participants are patients with 'Myocardial infarction', 'Percutaneous transluminal coronary angioplasty', 'Coronary artery bypass graft' and heart failure. The core components are baseline patient assessment, nutritional counselling, risk-factor management (lipids, BP, weight, diabetes mellitus and smoking), psychosocial intervention, PA counselling and physical exercise training. The programme has been implemented at RIPAS Hospital in Brunei Muara and Seri Suri Begawan Hospital in Kuala Belait districts and may be expanded to other major hospitals in other districts. An informal evaluation of the programme was conducted in 2008 amongst 93 (65 male and 28 female) participants. The findings showed no statistical significant improvement in outcomes amongst participants, particularly on weight loss, quality-of-life measures, diastolic BP and biological parameters (i.e. total cholesterol, LDL and FBS) in both gender. There was a statistically significant reduction ($p=0.05$) in WC only amongst females in the study (139).

Health Promoting School Programme (Health Promotion Unit, Ministry of Education)

The Health Promoting School (HPS) programme is also known as ‘Sekolah Mempromosikan Kesihatan (SMK) and has been implemented since 2001 and rolled out to all primary and secondary schools in the country. The programme is co-ordinated by the Health Promotion Unit (HPU) Ministry of Education (MOE) and is a collaborative effort with other government agencies particularly MOH, Ministry of Development and Ministry of Internal Affairs to promote health and safety amongst students in the country (144). The programme has not yet been formally evaluated.

Modification of IC-OSAF

For this work, the IC-OSAF was modified to suit the developing country setting particularly for the Brunei context by taking considerations of its demography, political system, health care system, socio-cultural profile and existing health policies and guidelines. Therefore, the trans-cultural issue was taken into consideration in this process as England has significant socio-cultural differences compare to Brunei. The seven steps were applicable in analysing Brunei obesity strategies, although some characteristics needed to be tailored to the national and district settings. There were several characteristics modified for Brunei-IC-OSAF as shown in ‘**Appendix 21**’ (‘The Characteristics of Brunei-IC-OSAF’) and explained below:

- Step one (‘**state the problem**’): The problem is defined at national and district level as the majority of health care services in the country are administered centrally (by MOH) to all the four districts (i.e. Brunei-muara, Tutong, Kuala Belait and Temburong). It is useful to obtain information at district level in order to understand the scope of the problem.
- Step two (‘**define the context**’): Brunei has a small geographical area and population size. Therefore, describing its demographic and determinants of health (including socio-economic profile, ethnicity, health, morbidity and mortality indicators) at national level are necessary to understand the context of the analysis. It is beneficial to add data sets from district level for the analysis.
- Step three (‘**identify local data & evidence used**’): MOH is the main provider of health services in the country, therefore national guidelines and local data (e.g. health

statistics, nutritional guideline and health reports) used by the MOH in formulating and implementing the obesity strategies were more relevant to be examined.

- Step four (**‘examine current strategies’**): The focus is on current strategies implemented by the MOH. The gold standard for the strategies is based on ‘The principles of prevention and management of obesity’ as recommended by WHO and NICE guidelines as it is arguably appropriate for Brunei and is a benchmark for improving the quality of existing obesity interventions and strategies implemented in the country. There is no published National obesity policy available in Brunei up to date.
- Step five (**‘define the outcomes’**): The outcomes were based on the National health policies to make the framework more applicable to the Brunei context and health issues and needs.
- Step six (**‘evaluation’**): Evaluation plans by MOH were examined because of their major role in health care services and national health policies in the country.
- Step seven (**‘make conclusions’**): One example of good practice was omitted which was considered not applicable for the Brunei context. In this step, the focus is on giving recommendations on the specific areas for improvement on the existing national obesity strategies.

The scoring system tool for the quality assessment was omitted because Brunei did not have existing National obesity policy yet, and thus the method was not appropriate for the analysis. The three categorical subjective measures used in the Brunei-IC-OSAF are **‘yes’** (most information is stated); **‘unclear’** (unable to make judgment due to lack of information stated); and **‘no’** (inadequate or no information is stated) to evaluate the depth of information extracted. It referred to a reviewer’s judgments on the level of completeness of the information reported using the characteristics of IC-OSAF.

Data extraction and analysis

The data was extracted independently by two assessors (AT & AM) using Brunei-IC-OSAF criteria (for details see ‘**Appendix 21**’ and ‘**Appendix 22**’). Any disagreements were resolved by discussion, or, when required, by a third reviewer. Where necessary, I sought any relevant missing information on policies from the Head of the Health Promotion Centre, MOH. The main methods of analysis were using constructs or characteristics of Brunei-IC-OSAF to identify possible issues and missing information. Then, themes were identified and generated when analysing the extracted information. The quality assessment was conducted based on the given criteria (as indicated in ‘**Appendix 21**’ ‘The characteristics of Brunei-ICOSAF’).

Validation

The result of this process was a narrative review and content validation was done through panel expert consultation. The main purpose of the validation method was to assess content of Brunei-IC-OSAF and the results produced were accurate and applicable to Brunei context. I contacted the office of Acting Permanent Secretary MOH Brunei and obtained a date for the consultation meeting. The office was also provided with a package of document and an invitation letter. The package consisted of scripts of the narrative review and a questionnaire. The validation questions posed to the experts were as followed and shown in ‘**Appendix 23**’ (‘validation questionnaire of Brunei’s obesity prevention and management strategies’): 1) ‘appropriateness of each construct of Brunei-IC-OSAF’; 2) ‘accuracy of the information presented in the results for each domain’; 3) ‘clarity and adequate coverage of the data for each domain’; 4) ‘appropriateness of data to Bruneian context’; 5) ‘limitations of the Brunei-IC-OSAF’; and 6) ‘suggestions for improvement’. The validation questionnaire was pre-tested to four health professionals who were not included in the panel, and the questions were refined based on their comments.

Seven experts from the MOH attended the consultation meeting. The validation questionnaire filled in by each expert during the session was given a code to protect anonymity of respondents. Only, I had access to the list that contained names, designations and contacts of the experts and the information was kept in password-protected laptop. The procedures were put in place to ensure the participants' confidentiality and safety of the data. The feedback from the experts in the validation process were incorporated into the narrative review and used to fine-tune the Brunei-IC-OSAF.

5.3. Results

The descriptions of the analysis of obesity strategies using Brunei-IC-OSAF for Brunei are stated in '**Appendix 22**' ('analysis of obesity strategies for Brunei').

Policy context

Obesity is highlighted as one of the major health problem in Brunei, as reported in various government health reports. The national statistics for adulthood obesity were reported in '1st Brunei National Health and Nutritional Status Survey (NHNSS) 1997 Report' and the 'IHSHPCS 2007-2009 Report'. The '1st NHNSS 1997 Report' showed high obesity prevalence among men (11.2%) and women (12.8%), and in total 45% of men and 44.1% of women were either overweight or obese. The 'IHSHPCS 2007-2009 Report' stated that 64.4% of participants were either overweight or obese. The national statistics for childhood obesity were based on data from Maternal Child Health (MCH) clinic and Schools Health Programme (SHP). For children under the age of 5 years (who attended the MCH clinic), there was relatively high prevalence of children who were overweight (57.2%) compared to those with normal weight (36%) in 2005; and similarly in 2009 (48.9% vs. 42%). The 'SHP' data showed a slight decrease in prevalence of overweight (14.7%) and obesity (1.8%) among children in specific school years (1,4,6 & 8) for 2005; and to 2009 (1.8% overweight vs. 12.4% obese). The health impacts related to obesity among adults were indicated by top five causes of mortality in the country in 2003 to 2007 (134). There were no obesity statistics (e.g. trends and prevalence) and its health impact among children (particularly for under age of 5

years and over as well as children at all school years) and adults were not reported at district level. There was limited information considered when defining the problem of obesity in the population (and the variables included were gender, health impact and mortality indicators). For example, the top five causes of mortality in the country were related to obesity in 2003 to 2007, based on 'Health Report 2007' (i.e. heart diseases and diabetes). The complete profile of the country and each district was not accounted to define the problem and its context (for instance demographic, socio-economic profile and ethnicity).

Current strategies

Although, the MOH's obesity strategy uses a multidisciplinary approach in tackling obesity and the current strategies mainly focus on the management of obesity at various settings. The key weakness that Brunei-IC-OSAF had identified during the analysis include limited management strategies available and insufficient information reported on the local authority and partners for community services.

Management strategies

The management strategies available include the implementation of a few local strategies (e.g. 'Healthy lifestyle clinic', 'Integrated civil servants health screening programme' and 'overweight clinic'). However, other management strategies were not clearly indicated (e.g. local obesity strategies such as policies and guidelines, specific training, well-being programme and HIA).

Services

There are various services implemented at primary care, secondary and tertiary care level in the country. The primary care services are implemented through the 'healthy lifestyle clinic' and 'smoking cessation' programmes. The interventions offered are PA, HE, dietary and

counselling support. The team delivering the ‘healthy lifestyle clinic’ programme includes GPs or community medical officers, a dietician, a psychologist, nurses, health educators and a PA trainer.

The community care services for obesity prevention and management is primarily implemented through an ‘overweight clinic’ programme, ‘youth outreach’ programme and ‘healthy village’ (‘mukim sihat’) programme. The ‘overweight clinic’ programme targets school-children; and there are various interventions used (e.g. medical screening, dietary, PA and counselling support with parental involvement). The programme is offered by a team of health professionals, including a community medical officer, school health nurses and a dietician.

The secondary services offered include metabolic and fitness assessments, PA, dietary, health education, drug treatment, bariatric surgery and psychological support by a team of health professionals (i.e. endocrinologist, dieticians, a psychologist, nurses and a bariatric surgeon). The tertiary care services are implemented through ‘cardiac rehabilitation’ programme that are implemented in two main hospitals (i.e. Brunei-muara and Kuala-belait districts). The services offered include assessment, dietary, PA, risk factor management, smoking cessation, counselling and psychosocial support. The team implementing the services comprise of a cardiac rehabilitation coordinator, a clinical psychologist, medical officers, a dietician, diabetic nurse educators, nurses, an occupational therapist, pharmacists, a physiotherapist, and religious teacher (as shown in ‘obesity prevention and management services’ table in ‘**Appendix 20**’). The secondary and tertiary care services are available through the ‘Obesity clinic’ programme implemented at RIPAS Hospital, but the services may not be available in the major hospitals in other districts.

There was limited information on the availability of community care services particularly self-help and commercial programmes implemented at district and national level in collaboration with local authorities (district level) and partners. There was no evidence that the primary, secondary and tertiary services were implemented in other districts (e.g. Tutong

and Temburong districts). There was no indication that clinical/treatment pathways were available for adults and children.

Local authorities and partners

There was sufficient information reported on the local authority and partners for community services. The early years setting had 'Breastfeeding initiatives' that was carried out at the MCH clinics in each district. The main objectives of the programme were to lower childhood obesity and infant mortality rates. The 'Healthy village' ('Mukim sihat') programme and 'Youth outreach' programme were community services offered by HPC. The 'Health village' ('Mukim sihat') programme offers healthy lifestyle activities implemented in partnership with the local communities in each village at the district level.

The 'Overweight clinic' programme and 'HPSs' programme were implemented in partnership with local schools, but the implementation of strategies relevant to obesity prevention and management are minimal. The 'Integrated civil servants health screening' programme was implemented in collaboration with workplaces particularly in public sectors. There was no information on self-help and commercial programmes reported. The availability of non-MOH public programmes was not documented.

Other strategy use

MOH had indicated using various aspects in planning and implementing their interventions, such as epidemiological (e.g. obesity prevalence and health impacts of obesity), clinical (e.g. primary care and secondary care services) and economic (such as national health budget in a year). However there was only limited information given. The ethnic and socio-economic diversity at national and district level was not clearly reflected by services. There was limited evidence showing incorporation of these aspects into planning and implementation of the interventions.

Use of evidence

The MOH had used information from various national published data (e.g. the '1st NHNSS 1997' report, the 'National Health Care Plan 2000-2010', the 'Vision 2035 Ministry of Health Strategy' policy, the 'HPB 2011-2015' policy & the 'National PA Guidelines for Brunei Darussalam') when reporting the prevention and management of obesity in various reports; whilst the use of evidence from the literature showing interventions were likely to be effective was very limited. There was no evidence reported on the use of districts level health information and data sets.

Policy outcomes & evaluation

The MOH had formulated short-term, intermediate and long-term outcomes in tackling obesity in the country (based on 'HPB 2011-2015' policy). However, the methods and activities of the initiatives in achieving the objectives were not specified, and therefore the initiatives might not be achievable in the projected time frames. The projected outcomes were also mentioned (and is based on 'HPB 2011-2015' policy). Interventions implemented by the MOH include the 'Healthy lifestyle clinic' and 'Smoking cessation' programmes (primary care); 'Youth outreach programme' and 'Healthy mukims' ('Mukim sihat') programme are implemented by HPC (community care); 'Overweight clinic' programme is implemented by school health services (community care); 'Obesity clinic' programme is implemented at RIPAS Hospital (secondary care); and 'Cardiac rehabilitation' programme is run at the Hospitals in Brunei-muara and Kuala belait districts (tertiary care). Others are the 'HPS' programme (MOH-schools partnership), 'Integrated civil servant screening programme (MOH-workplaces partnership), and 'breastfeeding' programme offered at maternal child health clinics and hospitals. The alternative interventions were not stated. There was no evidence showing the interventions are implemented in all the four districts in the country. There is no information indicated on the evaluation methods for the existing interventions and programmes.

Panel expert consultation

The experts from MOH who attended the panel consultation meeting were Deputy Permanent Secretary (DPS) MOH, Director of Health Services (DHS), Endocrinology Consultant, (EC) Head of Health Promotion Center (HHPC), Head of Internal Medicine (HIM) RIPAS Hospital, Head of Community Nutrition (HCN) and Head of Policy and Planning (HPP). The duration of the meeting was approximately 90 minutes. The validation results for MOH panel expert consultation were as followed:

Q.1) Is each construct for Brunei-IC-OSAF considered appropriate?

All experts (7, 100%) responded 'YES' to question one ('appropriateness of each construct of Brunei-IC-OSAF') and this showed complete agreement among experts that each construct of Brunei-IC-OSAF was appropriate.

Q.2) Is the information presented for each domain accurate?

There were only 5 experts (70%) who responded 'YES' to question two ('accuracy of the information presented in the results for each domain') that indicated agreement on the information presented for each domain was accurate. One expert (DPS) commented that Brunei has a small geographical area and Brunei-Muara district is the most populated area, therefore obesity statistics and its health impacts among adults and children for the other three districts may not be necessary to be collected. Meanwhile, another expert (HPP) argued that policy on obesity is not available because MOH intends to tackle NCDs rather than obesity alone. Brunei is a small country with small number of population therefore a comprehensive policy may be more appropriate and cost-effective.

One expert (EC) stated 'NO' to one domain ('current strategies') while another expert (HHPC) marked 'NO' to two domains ('current strategies' and 'evaluation plan').

According to an expert (EC), the secondary and tertiary care services for obesity management are provided through the 'Obesity Clinic' and 'Cardiac Rehabilitation' programmes that are

mainly implemented at RIPAS Hospital in Brunei-Muara district. The referral cases from other districts are directed to the Hospital. The services are often offered at inpatient and outpatient at the Hospital. There are no fees imposed for the services on Brunei citizens while non-Brunei citizens are charged a minimum fee. The clinical/treatment pathways of obesity for adults are implemented at the 'Obesity Clinic' (EC). While, another expert (HHPC) reported that services delivered by MOH are offered to all ethnic groups in the country. For the evaluation plan domain, one expert (HHPC) highlighted two additional key strategies implemented by MOH. Firstly, the establishment of National Task Force Committee to implement evaluation strategies for HPB and a plan has been drawn to review the existing 'food policy' to lobby for a legislation on reducing sugar and salt consumption in the population

Q.3) Is the quality assessment showed clarity and adequate coverage of information of each domain of IC-OSAF?

For question three on the quality assessment, all experts (7, 100%) responded 'YES' and agreed that the tool used was able to extract information for each domain of IC-OSAF. The information presented was clear and adequately covered.

Q.4) Is the included data considered appropriate for Brunei context?

All experts (7, 100%) responded 'YES' to question four ('appropriateness of data to Bruneian context') and they agreed that the included data was considered appropriate to Brunei context.

Q.5) Is there any significant limitation for Brunei-IC-OSAF as assessment tool?

For question five on the 'limitations of the Brunei-IC-OSAF', four out of seven experts (57%; DPS, DHS, EC, HHPC) responded 'YES' and argued that Brunei-IC-OSAF as assessment tool has one significant limitation where the data collected was only based on

documentation review. This method only took account of published data while some strategies may not be documented in policies or guidelines.

Q.6) Do you have any suggestions for improvement?

Two experts (28%; DPS, DHS) stated ‘YES’ to question six (‘suggestions for improvement’) and commented that Brunei-IC-OSAF need to be modified and used to analyze other policies rather than obesity prevention and management strategies alone.

Summary of findings

As mentioned above, there were several strengths and weaknesses that the Brunei-IC-OSAF identified while assessing the current obesity strategies implemented in the country (particularly in management strategies, services available, key outcome indicators and evaluation). The findings of the study demonstrated that there was lack of information reported on obesity statistics (i.e. prevalence and trends); health impacts; and use of comprehensive profile (e.g. socio-economic profile and ethnicity) when defining the problem of obesity at national as well as district level for adults and children. The management strategies to be considered were developing and implementing more local obesity strategies (such as policies and guidelines), specific training, well-being programmes; and HIA. There were various services implemented by the MOH (at primary, secondary and tertiary care levels), but there was no evidence the services were employed in all districts in the country (except for Brunei-Muara district). There was also limited availability of community care services, particularly with regards to self-help and the commercial programmes implemented in collaboration with local authorities (district level) and partners. The MOH has utilised various aspects in planning and implementing their interventions (e.g. epidemiological, clinical and economic), however MOH may benefit not only from using information from the national level, but also data sets from district level (i.e. GP data; obesity statistics for adults and children; clinical data from secondary and tertiary services; treatment costs, such as national direct costs of obesity; and the increasing cost of obesity drugs and lipid-lowering drugs). The ethnic and socio-economic diversity at national and districts level was not clearly

reflected by services and it is crucial for MOH to consider the inclusion of the given aspects in planning and implementing the services. The main weakness of the study was that no clear statement on methods and activities to achieve the targets/outcomes exists; also, there was no plan indicated to evaluate the interventions.

5.4. Recommendations

The MOH ‘Obesity strategy’ can be further improved by considering the recommended strategies, and a summary is shown in the ‘analysis of obesity strategy for Brunei’ table (**Appendix 22**).

The key recommendations for Brunei are to clearly define the problem of obesity at national and district level; implement more community services in collaboration with local authorities and partners; develop methods and activities for the initiatives to achieve the ‘strategic objectives’ (key outcome indicators) formulated; and formulate well-defined strategies for evaluation of the obesity strategies. According to NICE guidelines, the recommended strategies in the prevention and management of obesity include management strategies, services, clinical/treatment pathways, local partnerships, non-NHS public programmes and considerations of different aspects as stated in IC-OSAF (39).

Policy context

The national trends and prevalence of obesity in children must be stated (in addition to statistics on adulthood obesity) in planning and implementing respective interventions. At district level, the prevalence of obesity among children and adults is needed. It is important to differentiate between the prevalence of obesity in adults, children and ethnic groups, as the interventions for them will differ. There is a need to provide information on health impacts at district and national level for example, type 2 diabetes, stroke and CHD can all arise as a consequence of obesity and should be included and then compared to national averages. A comprehensive profile of the country must be considered (e.g. demographic,

socio-economic information and ethnicity) when defining the problem as it useful for planning and implementing interventions.

Current strategies

The management strategies to consider are local obesity strategies (i.e. policies and guidelines), trainings, well-being programmes and ‘HIA’. The policies and guidelines that might be relevant are: ‘Healthy public policy’, ‘Healthy workplace policy’, ‘National food standards’, ‘Healthy living strategy for local community’ and healthy living blueprint for schools’.

Community services

It is recommended the MOH must consider more community care services that focus on behaviour modification programmes in partnerships with other local authorities (particularly for early years settings, workplaces, schools, self-help and commercial settings) at national and district level. The strategies must take account of different cultural and religious practices within the communities.

The community initiatives programmes to consider are: improving access to healthy foods at affordable prices; healthy eating activities including cookery clubs for families; and physical exercise strategies for different age groups and population groups (e.g. older people, people with disability, children and family) including establishing community PA schemes and centres as well as improving walking routes and public transport schemes. These initiatives can be incorporated into the existing programmes such as the ‘Healthy village’ (‘Mukim sihat’) and ‘Youth outreach’ programmes at district levels to mobilise the community.

The broader community interventions recommended by WHO and NICE guidelines include: addressing the concerns of local people (e.g. availability of services, cost of behaviour change and dangers related with walking and cycling), working with local shops to promote healthy eating choices, promoting community schemes that improve access to PA, supporting and promoting behavioural change programmes, and providing on-going support for families at risk of obesity (e.g. children with at least one obese parent). (19, 20, 39). The important issues to be considered are safety, transport links and services

Early years settings

For early years settings (such as pre-school, childcare and family setting), the main interventions should incorporate a range of components that promote a healthy diet and increase PA (rather than focusing on parental education alone) when planning and implementing the obesity prevention programmes. The strategies may include: setting priorities for action (e.g. preventing excess weight gain, involving parents and carers in implementing actions, minimising sedentary activities during play time, providing regular opportunities for enjoyable PA sessions, implementing healthy diet guidelines, and ensuring children eat regular healthy meals in a pleasant and sociable environment. The diet programmes may include: interactive cookery demonstrations, video presentations and group discussions on practical issues (such as meal planning and shopping for food and drink). Similarly, the focus for PA intervention are: activities, opportunities for active play, safety and local facilities (39).

Schools

The MOH must consider implementing school health activities or programmes at national and district levels in partnership with local schools, community and private sectors. The relevant policies and guidelines are: 'Healthy living blueprint for schools', 'School healthy meals strategy' and 'Schools programme-curriculum based HE for healthy choices, healthy eating and physical activities'. The recommended key strategies in prevention and

management of obesity at a school level include: setting priorities for action (e.g. developing policies and guidelines), assessment of the whole school environment based on school policies and standards (for healthy weight, healthy diet and PA), providing training for staff on implementing healthy school policies, collaborating with relevant organisations to promote sports, and ensuring interventions are sustainable, multi-faceted and address the whole school. Other important interventions are delivering enjoyable physical education and activities, creating a pleasant and sociable environment for eating meals, considering children's views and preferences, identifying potential barriers in planning interventions and encouraging parents' involvement in interventions (39). The proposed strategies can be integrated into the existing programmes, such 'HPS' and 'Overweight clinic'.

Workplaces

With regards to workplaces, MOH needs to consider establishing partnerships with local businesses and supporting the implementation of workplace programmes. There are various interventions that can be implemented at workplaces, including the promotion of healthy choices (particularly encouraging healthy foods in hospitality and offering supportive physical environment, e.g. stairwells, secure cycle parking), providing incentives schemes (for instance the price of food and drinks sold in the workplace and gym membership), and improving food and drink provision (e.g. tailored educational and promotional programmes and supportive policies on pricing and advertisement) (39).

Self-help and commercial programmes

The possible strategies for self-help and commercial programmes that can be implemented by the MOH (at primary, secondary and tertiary care levels) include offering realistic recommendations to patients/organisations, endorsement of weight programmes based on best-practice, advise organisations to continue monitoring patients and provide support and monitor commercial weight management programmes to ensure they are meeting best-practice standards (39).

Clinical/treatment pathways

MOH needs to consider implementing clinical/treatment pathways for adults and children in the management of obesity particularly in the primary care settings. The pathways for children are assessment, measurements, referral to specialist, counselling, lifestyle (behavioural, diet, PA and family), drug treatment (not for children younger than 12 years, except under specialist paediatric settings) and follow-up. The pathways for adults include: assessment, measurements, referral to specialist, counselling, lifestyle (behavioural, diet, PA and family), drug treatment and follow up. The MOH also needs to consider providing channels for patients to access the clinical/treatment pathways (e.g. devising strategies to address obesity in workplaces, or via self-help, commercial, and community programmes).

Non-MOH Public programmes

There is a need to report non-MOH public programmes if available or planned and to consider the strategies that promote collaboration with local authorities and partners (i.e. at national and district levels). Although, there are several initiatives formulated to promote ‘networking’ within the ‘HPB 2011-5’ policy, but the information on the methods and activities of the initiatives are not stated.

Other strategy use

The MOH needs to consider utilizing different services for interventions such as epidemiological (e.g. obesity trends and prevalence, healthy impacts of obesity), clinical (e.g. GP & secondary services) and economic (e.g. national direct costs of obesity, increasing cost of obesity drugs & lipid-lowering drugs, MOH operating cost in a year) at national and district level. The MOH’s obesity strategies should reflect the ethnic and socioeconomic diversity of its patients.

Use of evidence

Although, the MOH has reported using information from various national published data and guidelines; it is important to incorporate health reports and data sets at district level in planning and implementing the interventions. The ‘Obesity strategy’ implemented would benefit from including evidence of effectiveness from recent medical literature.

Policy outcomes & evaluation

The MOH has formulated short-term, intermediate and long-term outcomes in tackling obesity in the country (based on ‘HPB 2011-2015’ policy). However, specific and measurable methods and activities to achieve the targets/outcomes need to be decided on and clearly stated in the MOH ‘Obesity strategy’. And including more intermediate targets would create a step-wise progression towards achieving the overall aim within the projected time frames. There is a need to consider integrating projected outcomes when planning and implementing obesity policy. Evaluation process and methods is critical to be included when planning and implementing interventions and the process should be agreed on, as well as when this is performed.

5.5. Lessons learned from the study

From the analysis above, I have identified several lessons learned when applying Brunei IC-OSAF to assess obesity strategy implemented in the country, specifically related to policy content and methods. Seven experts from MOH validated the Brunei IC-OSAF and the narrative review through panel expert consultation, and indicated good agreement on both the application of tool and results presented.

Policy content

In regards to the policy content, I learned that the ‘true’ scope of obesity problem among adults and children in each district and at national level may not be well defined (such as relevant risk factors and at risk groups) due to lack of information available on obesity

statistics (i.e. prevalence and trends); health impacts; and use of comprehensive profile (e.g. socio-economic profile and ethnicity) when defining the problem of obesity at the respective levels. Six experts agreed that scope of obesity was not reported for each district across health reports, whereas one expert argued that reporting obesity statistics and its health impacts for Brunei-muara district is considered representative of the whole population because the respective district is mostly populated geographical area in the country. The national obesity statistics may not be accurate when the scope of obesity reported did not reflect the obesity prevalence and profile of each district, and thus the interventions implemented might not be tailored to tackle the existing context.

Current strategies

MOH has reported implementing services at primary, secondary and tertiary care levels primarily at Brunei-muara district. I learned that there was no evidence indicating the services were carried out in other districts in Brunei, and relevant head of departments were contacted to obtain the necessary data during the analysis. Also, it was difficult to assess if the strategies and services were effectively implemented due to lack published evaluative data available. The majority of the experts considered the information presented on services implemented by MOH in the narrative review was accurate.

The ethnic and socio-economic diversity at national and districts level was not clearly reflected by services implemented based on information gathered from health reports. For instance, programmes tailored to specific ethnic groups or socio-economic status was not stated in health policy documents. I learned that Brunei-ICOSAF might not completely able to capture trans-cultural issues (such as lack of tailored interventions for different ethnic groups, inequality and inequity) based on documentation review method because data and indicators on socio-economic status (including ethnicity) and obesity in Brunei were not reported. It can be considered as one of the weakness of Brunei-IC-OSAF in this study. It is crucial for MOH to consider the inclusion of the given aspects in planning and implementing the services to tackle obesity in high-risk groups. One expert (HHPC) commented that services delivered by MOH were offered to all ethnic groups in the country, but the expert

was not able to provide details of the specific services or the programmes mentioned. Other experts (7) showed good agreement on the accuracy and appropriateness of the findings.

Methods

The Brunei-IC-OSAF is the only tool available to analyse obesity strategy implemented at district and national level. I learned that the characteristics of the tool enabled extraction of information (on existing obesity strategies implemented in Brunei) encompassing wide-ranging areas (such as scope of obesity, services available, treatment pathways and policy outcomes as well as evaluation) from various sources, as discussed above. The appropriate strategies were compiled into a comprehensive policy document and presented to experts from the MOH. In addition, several strengths and limitations of the existing obesity strategies were identified and discussed with experts. There were various recommendations generated from the analysis process for improvements of obesity policy actions in Brunei. The development and application of Brunei-IC-OSAF in this study contributes to the formulation of a comprehensive obesity policy for Brunei, and considered as useful reference document for MOH. All experts agreed that the included data was considered appropriate to Brunei context. I also found that the validation process of Brunei-IC-OSAF and the narrative reviews with expert enable realistic, context-specific and accurate results were presented in this study. There were several issues raised during the expert panels consultation meeting that include: formulation of cost-effective interventions that focus not only on obesity but also NCDs (as mentioned earlier NCDs are the top causes of mortality and morbidity in the country and Brunei has small geographical area with small total number of population); and using documentation review as data collection methods may have limited realistic presentation. An expert highlighted that the Brunei-IC-OSAF only took account of published data while some strategies may not be documents in health policies or guidelines. It is one the main limitations of this study and may potentially affect the findings presented. However, I learned that validation with experts panel from MOH was a rigorous approach and allowed minimisation of biases (such as reporting bias).

5.6. Conclusion

The Brunei-IC-OSAF is a practical and easy-to-use tool for analysing local obesity prevention and management strategies. Although there are various services implemented in the country to prevent and manage obesity among the population, obesity continues to be a growing health concern. The framework contributes to formulation of a ‘comprehensive obesity policy’ for Brunei that is evidence based and which may generate more research in this area in the future.

6.0. Discussion

6.1. Scope of the study

Evidently, tackling obesity is a global public health challenge because obesity has showed no sign of decreasing in recent decades and it contributes to a huge burden of diseases to society. In England, if the current interventions continue to be ineffective, there will be a significant shift in the proportion of individuals within ‘healthy weight’ to ‘overweight’ and ‘obese’ in the future. The obesity strategy and policy in England has been heavily scrutinised and criticised for being ineffective in tackling the problem of obesity, as highlighted in many government’s health reports. The key reason for this issue may also be related to ineffective implementation of obesity strategies and policies at a local level. Studies had shown that the most effective public health interventions for obesity were BCM used in combination with diet and PA (at individual level) and implementation of effective local policy actions (at population level).

In this thesis, I evaluated the effectiveness of current public health approaches for obesity prevention and management that were implemented at local (community) level in England, particularly focusing on obesity strategies, and I then identified obesity strategies relevant to Brunei Darussalam as lessons learned from England. The main hypothesis investigated was ‘BCMs (in particular TTM SOC) used in combination with diet and PA as intervention resulted in weight loss among overweight and obese individuals, and the weight loss is maintained over a period of one year’. Meanwhile, ‘gaps in ‘obesity strategies’ (policy) at local levels may contribute to ineffective implementation of ‘upstream’ intervention for obesity in England’. This thesis attempted to address the research questions and generated substantial new evidence as extensively discussed in three key projects (shown in chapters three, four and five respectively).

6.2. Synthesis of findings

This study determined that diet in combination with PA were effective public health interventions for obesity prevention and management among adults. The finding was supported by few studies that showed diet in combination with PA interventions resulted in modest weight loss (2 to 5kgs) after 1 to 2 years of intervention (25, 27, 63, 64), and other studies had shown a significant weight loss in shorter duration of intervention (>1 year) among adults (23, 30). Apart from weight loss, it was found that the given interventions had positive impact on other outcomes including improved cardiovascular risk factors at 12 months (23); and significant mean decrease in the glycated haemoglobin at 6 months and 12 months in people with type 2 diabetes (62). Arguably, these studies had methodological issues and may be subjected to biases except for one trial (63). Both diet and PA interventions were widely implemented at public health settings (such as workplace, schools and community) (21). Meanwhile, policy actions were reported as useful public health intervention in the prevention and management of obesity at population level in many reports (20, 26, 39, 65, 96). These reports used limited evidence from rigorous studies. In contrast, few studies reported lack of evidence on the effectiveness of health policy or actions in guiding public health intervention for obesity (36, 97). Both studies had methodological issues (such as use of review protocol and quality assessment were not clearly reported) and these may affect the findings presented.

BCM used in combination with diet and PA as interventions for obesity were reported to be effective in generating weight loss as shown in some studies (88, 89), while other studies reported significant decreased in mean body weight (from 1.10 kg to 5.20kg) at 3 months (78) and 18 months (90). In addition, the interventions resulted with significant changes in dietary outcomes (including reduced fat intake and improved nutrition knowledge) (76) and positive changes in PA (77) among adults. In contrast, studies using similar interventions did not show changes in legume consumption among children (145) and healthy eating behaviour in youth (79). TTM SOC in combination with diet and PA was widely used as interventions for obesity in clinical and public health settings (24), therefore a systematic review was conducted to assess the effect of the interventions in this study.

The key finding of this study found that TTM SOC used in combination with diet and PA interventions have limited impact on weight loss (about 2 kg or less) at 12 months among overweight and obese adults. In contrast, few studies showed that the interventions produced significant mean weight loss (between 0.5kg-5.6kg) at 6 and 12 months (80, 81, 83), and higher mean weight loss was reported at 24 months in one study (81). While, other studies reported greater weight loss (about 3 to 5 kg) (25, 27), although these studies did not look specifically at TTM SOC as a theoretical framework. There was no conclusive evidence for sustainable weight loss beyond 12 months in the study. Several studies supported the finding that there was no conclusive evidence for sustainable weight loss, particularly after 12 months, and that the effectiveness of TTM SOC for weight loss beyond this time was inconsistent (100, 101, 104, 105, 146, 147).

Also, TTM SOC combined with diet, PA and other interventions had a positive impact on fruit and vegetable consumption, as well as increased exercise outcomes behaviour that were sustainable over long periods (12 to 24 months). However, an earlier review done on TTM SOC application and diet intervention did not find conclusive evidence, particularly on dietary change amongst overweight and obese adults. The review argued that most included studies differed in terms of the aspect of diet being examined, staging algorithms and dietary assessment methodology used. Therefore, there were significant variations in results, which made it difficult to interpret the results of those studies (110). The studies included in the review were not specifically RCTs and there was lack of trials done at that time, as well as a less robust review methodology, may had affected the results. Meanwhile, I had only included RCTs and used robust methodology in the systematic review.

The review found that TTM SOC was used inconsistently as a theoretical framework for intervention across included trials. It was used in the three typical ways (as stated in chapter four) and should therefore be applied with caution in practice, because its impact depends on both the way it was used and in combination with other strategies like diet, physical activities and counselling. The finding was supported by another study which highlighted the insensitivity of the TTM algorithm, with most individuals failing to meet the behavioural criteria of the model stages (112).

Variations of strategies at local level

In England, the policy action intervention to prevent and manage obesity at local level were ineffective as reported in various UK government health reports. This study found that H&F PCT's obesity strategy implemented at PCT level had several limitations and omissions of the strategies. These were consistently identified at various components of modified IC-OSAF particularly in policy context, services, other strategies used and policy outcomes. For instance, in policy context there was lack of information on local obesity prevalence, health impact and comprehensive profile of the PCT reported in H&F's 'obesity strategy'. It was important to define the scope of obesity in the PCT (such as differentiating between prevalence of obesity in adults and children) as the interventions for them differed. This finding was supported by another study that reported descriptive data (including the local population's vital statistics, such as births, deaths by age and sex, and cause of death, as well as health statistics, such as morbidity by cause and severity, outcome data and burden of disease data were crucial in defining the problem in policy (125).

Meanwhile, in H&F PCT's 'obesity strategy', the existing obesity strategies were implemented via primary and secondary care, whilst there was no indication that the PCT had implemented tertiary care. There was insufficient information reported on the local authority and community services as partners, except for some work with schools. This approach did not meet the recommended prevention and management strategies of obesity stated in the NICE guidelines (39)

There were also limitations and omissions established in obesity strategy across the four PCTs in NWL. For instance, all included PCTs reported that main services were available (primary care and community care), but the services for secondary care and tertiary care vary across the PCTs. This study has identified few limitations in the obesity strategy of each PCT including there was lack of information reported (in particular on the use of local obesity statistics, e.g. prevalence and trends) in defining the scope of obesity in adults and children; and all PCTs failed to provide a comprehensive profile (e.g. demographic, socio-economic profile, health and mortality indicators) in each 'obesity strategy report'. There was only one

PCT (Brent) graded as having a ‘high quality’ obesity strategies based on IC-OSAF. The given limitations and omissions contributed to variations in obesity management between PCTs in NWL. The finding was endorsed by a report that highlighted ineffectiveness of obesity management in England may also be related to ineffective implementation of obesity strategies and policies at a local population level (17).

Similarly, the key finding of analysis on obesity strategies in Brunei using modified IC-OSAF (namely Brunei-IC-OSAF) demonstrated few limitations in the existing strategies implemented in the prevention and management of obesity and also omissions in the obesity strategies implemented in particular at district levels. These limitations include lack of information stated on obesity statistics (i.e. prevalence and trends); health impacts; and use of comprehensive profile (e.g. socio-economic profile and ethnicity) when defining the problem of obesity at national as well as district level for adults and children. Hence, the ‘true’ scope of obesity problem in each district and at national level may not be well defined (such as relevant risk factors and at risk groups), and consequently the interventions implemented might not be tailored to the current situation. This finding is supported by another study that suggested comprehensive profile is essential to understand factors that may contribute towards the trend and prevalence of obesity amongst the population at the national and local level. The purposes are to provide the background information on the country that puts health policy in context and to understand the socio-cultural determinants of health problems. The contextual factors that may be useful in this process include the political system, geography and social and economic conditions (125). There was no validation conducted in this study that may affect the results. Meanwhile, there was no evidence that full range of services was employed in all districts in the country (except for Brunei-Muara district), even though MOH has indicated of implementing various services (primary, secondary and tertiary care) as reported in government’s health reports.

Evidently, these variations occurred at community rather than national level policies this is where most issues arise in policy planning and implementation, and therefore the variations might contribute to ineffective implementation of policy action intervention for obesity in England and Brunei. Two studies showed similar finding that reported lack of evidence on

the effectiveness of health policy or actions in guiding public health intervention for obesity (36, 97) and the contributing factors identified include large variation present within policy action implemented for public health and nutrition policies (97). These studies were subjected to methodological issues such as protocol used and quality assessment tool were not reported.

Trans-cultural issues

This study highlighted an important trans-cultural issue in implementing obesity strategies particularly for PCTs in NWL. It was found that the ‘true prevalence’ of overweight and obesity among the ethnic groups in the H&F PCT was unclear because lack of information was reported on obesity statistics and comprehensive profile as mentioned above. In addition, services implemented in the PCT were not adequately reported in H&F PCT’s obesity strategy. This was compounded by the fact that the specific methods and programmes to tackle obesity were included. On the contrary, the ethnic and socio-economic diversity of the PCT was reflected by services that target specific groups in three PCTs (Brent, Hounslow and Westminster), and not stated in one PCT (Hillingdon). The targeted groups in particular were vulnerable groups at risk of obesity particularly people from different ethnic background and people with disabilities. Overall, there was inconsistency in obesity strategy implemented across the PCTs in NWL and the services may not in particular taking account of the ethnic backgrounds of population.

Likewise, the study done in Brunei showed that ethnic and socio-economic diversity at national and districts level was not clearly reflected by services delivered by MOH. It was critical for MOH to consider the inclusion of the given aspects in planning and implementing the services as ethnicity is one of the contributing factors for obesity as highlighted in reports (19, 20). These reports used limited evidence from high quality studies. The finding was similar with a recent study’s finding showing some ethnic minorities (Indian and Chinese) in England were more likely to be obese in the second generation than the first generation (56). On the other hand, another study argued that there was lack of consensus on obesity prevalence among both South Asian or Black children and adults relative to Caucasians in the

UK. Black adults generally had a higher risk for obesity than Caucasians. Both Chinese children and adults had lower risk for obesity than Caucasians (57). Both studies had methodological issues and potential biases that may affect the findings.

6.3. Relevance of findings

The primary hypothesis investigated was ‘BCM used in combination with diet and PA as an intervention resulted in weight loss among overweight and obese individuals, and the weight loss is maintained over a period of one year’. Similarly, the main finding for the review on the use of TTM SOC combined with diet and PA intervention supported the above hypothesis and showed there was no conclusive evidence for sustainable weight loss, particularly after 12 months. However, the interventions resulted in minimal weight loss (about 2kg or less).

The second hypothesis examined how the ‘upstream’ interventions (policies) work at the local setting, thus suggesting that ‘gaps in ‘obesity strategies’ at local levels may contribute to ineffective implementation of ‘upstream’ intervention for obesity in England’. Two projects were conducted to test the above hypothesis using IC-OSAF to analyse the content of ‘obesity strategy’ implemented at PCTs in NWL. Both studies supported the hypothesis as demonstrated in the key findings that the policies implemented were not completely meeting the criteria for NICE guidelines and IC-OSAF helps to identify issues in the policy for each PCT, as well as significant variations across the PCTs that may contribute to ineffective implementation of ‘upstream’ interventions (policy) for obesity prevention and management in England. All the objectives of the study were met and few limitations were identified.

6.4. Quality of evidence

In this study, primary studies, reports and reviews were evaluated in the literature review to determine the effectiveness of public health interventions. Critical appraisal format was used to assess the quality of the evidence. In the literature review, there were variations in the type

of studies, methods and outcomes reported in the included studies or reports that might affect the quality of the evidence presented. The evidence was presented as a narrative literature review, and there were few high quality studies included.

In the systematic review study of TTM SOC, five small to medium RCTs (including a total of 3910 participants) were evaluated using a set of inclusion and exclusion criteria. Meta-analysis was not appropriate because there were different types of outcomes presented in the trials (dichotomous versus continuous) and the data for intervention groups as well as control groups for each outcome was not completely reported by each trial. There were also variations in the timing of outcome measurement in the included trials. One of the key methodological limitations of the trials was that most had limited intervention and follow-up duration (one year or less) and it was therefore not possible to assess sustainable weight loss amongst participants. There was also inadequate information on methods of randomisation, allocation concealment and blinding reported by most trials, such that they had to be categorised as high-risk bias trials. Other potential sources of bias identified were sampling, selection, and recall bias. The trials were mainly performed on the ITT basis, but there were key bias issues affecting the internal validity of the results, as discussed earlier. The key weaknesses of this review were differences in interventions and controls across the included trials as mentioned in chapter four.

The ways in which potential biases in the literature review process were minimised include: well defined inclusion and exclusion criteria and use of critical appraisal tool (38), similarly the methods used for the review consist of independent data extraction by two assessors, used of assessment risk of bias tool (116), and application of effects of intervention tool (to examine and compare outcomes for intervention and control groups).

The obesity strategy of 5 PCTs was evaluated using IC-OSAF and a pilot study was conducted to assess the framework. The methods used to reduce potential biases in the analysis include two assessors independently conducted data extraction, data analysis and quality assessment; any disagreements were resolved by discussion, or, when required, by a

third reviewer; and quality assessment tool as discussed in chapter four. Experts validated the IC-OSAF and results of the study. The feedbacks given by the experts was incorporated into the narrative review and used to fine-tune the framework. There was missing information identified across the ‘obesity strategy’ of all included PCTs that might affect the findings.

Similarly, Brunei’s obesity strategy was analysed using modified IC-OSAF (namely Brunei IC-OSAF). The scoring system tool for the quality assessment was not appropriate for the analysis and omitted from Brunei-IC-OSAF because Brunei does not have an existing ‘obesity strategy’ document yet. The Brunei-ICOSAF and narrative review was validated by expert panel consultation as discussed in chapter five. The framework had examined the existing obesity strategies implemented in the country and had identified several strengths and weaknesses.

6.5. Generation of new evidence

This work generated new evidence to the existing knowledge and may provide better understanding on obesity and effectiveness of public health interventions for prevention and management of obesity.

BMI versus WC and WHtR

BMI was reported as common measure for obesity in population level studies, however it is a weak measurement for obesity as discussed in this thesis. For instance it did not account for body fat distribution; weak discriminatory index between excess adipose tissue and high lean muscle mass (42, 43); and had lowest sensitivity and specificity measurement for fat in both genders (49). In comparison to BMI, WC had strong correlation with abdominal fat and was associated with cardiovascular risk factors (46, 47); best predictor of metabolic syndrome (at cut-off 99.5cm for men and women was 91cm) (49). WHtR was reported significantly better

proxy for measuring abdominal obesity over BMI (50, 51); and detecting cardiovascular risk factors in adults (44). In light of this evidence, it is useful to measure abdominal fat using WHtR and WC when determining obesity at population level rather than BMI alone.

Biological and genetic predispositions to obesity

This study found growing evidence that the development of obesity may be linked to biological (7, 20) and genetic predispositions (9, 10, 20, 54). For example, obese individuals were found to be leptin-resistant and the development of obesity may be caused by abnormalities in the leptin and ghrelin systems (52). Meanwhile, polymorphism (rs17782313) near the melanocortin 4 receptor (MC4R) gene was significantly associated with obesity risk (54). The public health interventions for prevention and management of obesity among overweight and obese individuals need to incorporate those biological and genetic factors when designing and implementing interventions at individual and community levels.

Effectiveness of public health interventions

At individual level, BCM in combination with diet, PA and other strategies as intervention for obesity was considered most effective as reported across government reports (such as ‘WHO Obesity Consultation Report’, ‘Foresight Report UK’ and ‘NICE guidelines’) and studies. In particular, TTM SOC was commonly used BCM to guide interventions at various clinical and public health settings. In contrast, this study has proved that TTM SOC used with diet and PA interventions produced minimal weight loss (>2 kg) at 12 months, and sustainable weight loss beyond 12 months was inconclusive.

In general, the findings of the reviews were generalisable to overweight and obese adults who were undergoing lifestyle modification programmes for weight loss particularly programmes based on behaviour-change models or theories in primary care or community settings, as it provides ‘practical’ strategies, a ‘realistic’ duration of intervention and achievable outcomes. This evidence can be utilised by public health practitioners and professionals when planning and implementing obesity prevention and management programmes. It can also be incorporated into the national guidelines as evidence for interventions.

Meanwhile, policy actions as intervention for obesity in public health had been widely reported as useful. The IC-OSAF was developed as an evidence-based obesity strategy assessment framework to analyse the policy content of local ‘obesity strategy’ (PCTs) for England. The IC-OSAF allows identification of any potential and actual policy content issues (for example, lack of baseline statistics and details that reflect on the relationship between obesity and demographic variables when defining the scope of obesity and policy context). It enabled users to examine and ensure strategies were completed according to national guidelines, which were crucial for effective implementation of obesity strategies at the local level. The framework can be modified and used to analyse the obesity strategies implemented in other settings (e.g. England and Brunei). The quality assessment method was integrated into IC-OSAF as an evaluation tool to assess the quality of the policy (i.e. qualitative and quantitative judgements on the completeness of the policy content based on IC-OSAF criteria). The results of the studies offered comprehensive and evidence-based recommendations as a product of the content policy analysis (based on gold standards for the prevention and management of obesity, such as ‘WHO obesity consultation report’ and NICE guidelines).

For Brunei, the ‘HPB 2011-2015’ is used as a blueprint for obesity prevention and management. However the ‘national obesity policy’ is not currently available. The development and application of Brunei-IC-OSAF in this study contributes to the formulation of ‘comprehensive obesity policy’ for Brunei, and considered as useful reference document for MOH. Also, the Brunei-IC-OSAF has identified several strengths and weaknesses of the existing obesity strategies implemented and generated recommendations for improvements of

obesity policy actions in the country. The key recommendations include management strategies (e.g. policies and guidelines), services and evaluation may be useful in strengthening the existing ‘obesity strategies’ in the country. The policies and guidelines that might be relevant to Brunei were: ‘Healthy public policy’, ‘Healthy workplace policy’, ‘National food standards’, ‘Healthy living strategy for local community’ and ‘Healthy living blueprint for schools’. Brunei may benefit from implementing more community services in collaboration with local authorities and partners and formulating clinical/treatment pathways for adults and children. These approaches mark a transition from conventional methods (i.e. primary, secondary and tertiary interventions) to a new modified concept of prevention and management of obesity as recommended by the ‘WHO consultation obesity reports’ and ‘WHO global strategy on diet, PA and health’.

Limitations

In general, there are a few main limitations identified in this work. The studies evaluated in the review were mainly RCTs and majority of them had to be categorised as high-risk bias trials, which may affect the results. The included studies have short-to-medium duration of interventions and follow up (2 years and below) and it was therefore not possible to assess sustainable weight loss amongst participants. The IC-OSAF usage might be limited to UK policy priorities in tackling obesity at primary care level. Therefore, it was necessary to take into account relevant existing national guidelines in applying the IC-OSAF framework in countries other than the UK. Similarly, the Brunei-IC-OSAF was tailored for Brunei and its usage was limited to assess the obesity strategies implemented in the country. The prior assumption was that users have basic knowledge of the terms used in the IC-OSAF framework. The framework had been refined through the application of IC-OSAF to obesity strategies in different settings (i.e. England and Brunei), validated and can be further improved using feedback from users.

7.0. Conclusion

7.1. Implications to practice

Obesity is one of the world's fastest growing health threats, and commissioning and developing obesity management programmes is a priority for policy makers, clinicians and managers in health systems across the world. The BCM or theories (particularly TTM SOC, SCT and SET), with a combination of diet and PA were widely used as intervention frameworks in weight management programmes across primary care and community settings and showed significant minimal mean weight loss (between 0.39kg to 6.6kg). There was generally no conclusive evidence for sustainable weight loss after 24 months. Meanwhile, TTM SOC and a combination of PA, diet and other interventions resulted in minimal weight loss (about 2 kg or less), and there was no conclusive evidence for sustainable weight loss particularly after 12 months. In practice, TTM SOC must be applied with caution, because it has a variable impact depending on how it is used and with what other factors (such as whether it is used in combination with other strategies and the duration of intervention and follow up). The evidence from these reviews can be used to better inform the planning, implementation and evaluation of such programmes. The reviews also inform practitioners on existing evidence and expected outcomes (such as weight loss, change in PA and dietary intake) when using BCM (particularly TTM SOC) weight management programmes. Finally, it can also serve to inform and enhance patients' understanding of the effectiveness and limitations of their treatment regimes. Generally, the review may help to promote knowledge, understanding and practice in tackling the important global health challenge of obesity.

For England, the ineffective implementation of obesity strategies or policies at community level was a critical issue and had been a national governmental concern for many years. Therefore, the IC-OSAF framework might be a useful tool for policy analysts to examine the content of obesity strategies within a short time frame and it was inexpensive. It enabled identification of issues in the obesity strategies for each local setting (PCT) and reduce variations in obesity management across them (PCTs). It was also applicable in analysing obesity strategies for developing countries, like Brunei. As a consequence, the findings allowed policy makers to make more rapid decisions and set up relevant strategies or priorities.

7.2. Implications to research

The review used rigorous and systematic methodologies to examine relevant studies and produced findings that have important implications for future research. There were, however, some methodological limitations identified, for example: some of the included studies had small sample sizes and statistical power was therefore often inadequate to detect any significant association between intervention and outcome. In addition, most of the included studies were heterogeneous, particularly in terms of interventions and outcomes. The issue of heterogeneity can be minimised across the included studies by reporting clear and specific definitions for their intervention, as well as outcomes measured (i.e. primary and secondary outcomes), consequently meta-analysis can be conducted if appropriate. Furthermore, most of the included studies were categorised as high risk of bias because there was insufficient information reported on the methodology (such as methods of randomisation, allocation concealment and blinding) of the RCTs and the non-randomised studies (including methods of assignment, blinding and outcomes) that greatly affected the methodological quality of the studies (specifically the internal validity). The potential biases within a study can be minimised by using a protocol in conducting and reporting research, and in turn may enhance the quality of the study. Future research must focus on well-designed studies; RCTs with large sample sizes and long durations of intervention and follow-up are particularly crucial in evaluating the effectiveness of the BCM for sustainable weight loss amongst overweight and obese adults. In addition, a robust systematic review of non-RCTs to assess the effectiveness of TTM SOC for sustainable weight loss in overweight and obese adults may be of value in the near future.

Policy analysis studies are critical in evaluating the content, process and outcomes of the obesity strategies implemented at various levels of the population. Thus, the IC-OSAF contributes to a 'new' analysis method used to assess the local obesity policy, where most problems of ineffective implementation of 'upstream' interventions (policies) occurred particularly in the case of England. The framework has been validated and fine-tuned during its application process and minor revisions made for clarity and applicability of the framework at different settings (i.e. England and Brunei). It has been modified into a practical tool used to analyse the content of obesity strategies implemented at community

level, which has advantages over other frameworks. The framework can be further refined from application to obesity strategies at other settings and through feedback from users, which generates more research in this area.

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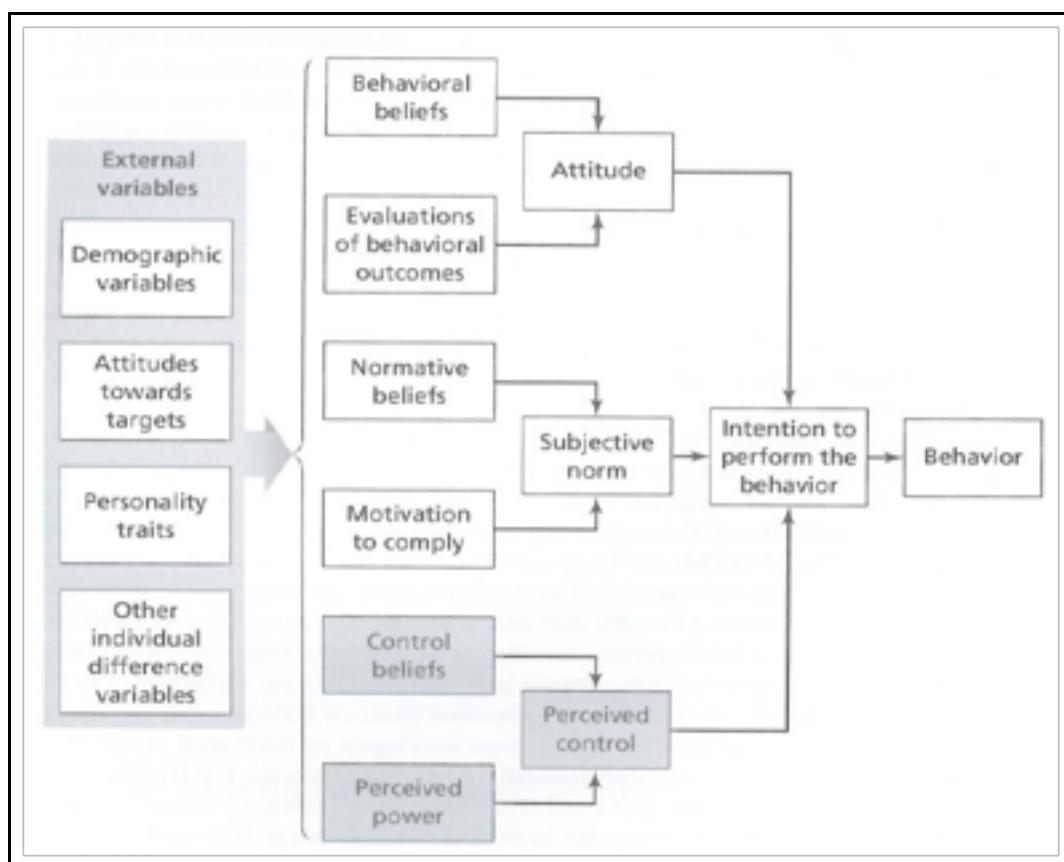
9.0. Appendices

Appendix 1: Major concepts in social cognitive theory and implications for intervention

Concept	Definitions	Implications
Environment	Factors physically external to the person	Provide opportunities and social support
Situation	Person's perception of the environment	Correct misperceptions and promote healthful norms
Behavioural capability	Knowledge and skill to perform a given behaviour	Promote a mastery learning through skills training
Expectations	Anticipatory outcomes of behaviour	Model positive outcomes of healthful behaviour
Expectancies	The values that the person places on a given outcomes, incentives	Present outcomes of change that have functional meaning
Self-control	Personal regulation of goal-directed behaviour performance	Provides opportunities of change that have functional meaning
Observational learning	Behavioural acquisition that occurs by watching the actions and outcomes of other's behaviour	Include credible role models of the targeted behaviour
Reinforcements	Responses to a person's behaviour that increase or decrease the likelihood of recurrence	Promote self-initiated rewards and incentives
Self-efficacy	The person's confidence in performing a particular behaviour	Approach behavioural change in small steps to ensure success; seek specificity about the change sought
Emotional coping responses	Strategies or tactics that are used by a person to deal with emotional stimuli	Provide training in problem solving and stress management; include opportunities to practice skills in emotionally arousing situations
Reciprocal determinism	The dynamic interaction of the person, the behaviour, and the environment in which the behaviour is performed	Consider multiple avenues to behavioural change including environmental, skills and personal change

Appendix 2: The constructs and definition of TRA and TPB

Concept	Definitions
Behavioural intention	Perceived likelihood of performing the behaviour
Attitude Behaviour belief	Belief that behavioural performance is associated with certain attributes or outcomes
Evaluation	Value attached to a behavioural outcome or attribute
Subjective norm (Normative belief)	Belief about whether each referent approves or disapproves of the behaviour
Motivation to comply	Motivation to do what each referent thinks
Perceived behavioural control	Control belief: perceived likelihood of occurrence of each facilitating or constraining condition Perceived power: perceived effect of each condition in making behavioural performance difficult or easy



Appendix 3: The characteristics of process of change

Process	Characteristics
Conscious raising	<ul style="list-style-type: none"> the process whereby people obtain information about themselves and the problem behaviour develop awareness on the health problem and the causes and consequences of continuing a particular behaviour it may help move a person from pre-contemplation to contemplation
Dramatic relief	<ul style="list-style-type: none"> refers to emotional arousal or reacting emotionally to the behaviour in questions, e.g. talking about quitting smoking
Environmental re-evaluation	<ul style="list-style-type: none"> looking at the behaviour in light of its impact or effect on the physical environment, e.g. understanding the environmental effects of second-hand smoke
Social liberation	<ul style="list-style-type: none"> the process whereby options or alternatives are sought that supports the new behaviour, e.g. for a smoker trying to quit, social liberation would be sitting in the non-smoking section of a restaurant
Self-re-evaluation	<ul style="list-style-type: none"> the process in which people look at themselves with and without the problem behaviour and assess the differences in their self-esteem, e.g. for smokers the process means thinking about themselves and comparing it to how they feel about themselves as non-smokers
Stimulus control	<ul style="list-style-type: none"> when people remove the cues or triggers for the problem behaviour from their environment, e.g. the smoker might avoid drinking coffee after dinner and switch to drinking tea, since coffee is a trigger for many smokers
Helping relationships	<ul style="list-style-type: none"> relationships with people who act as a support system for changing the unwanted, unhealthy behaviour
Counter conditioning	<ul style="list-style-type: none"> refers to a healthier behaviour is substituted for the unhealthy one
Reinforcement Management	<ul style="list-style-type: none"> a process of reinforcing behaviour using rewards and punishments unwanted behaviour can be changed through the fear of punishments or negative consequences rewards for engaging in the targeted behaviour are more natural
Self-liberation	<ul style="list-style-type: none"> individuals choose to change their behaviour and believe that they can and commit to making the change

Appendix 4: Characteristics of included studies

Study	Dinger 2007
Methods	DESIGN: RCT; Parallel; Randomisation ratio not stated
Participants	COUNTRY: USA SETTING: 1 centre; delivered by health care professionals at community and university (via email). I=32, C= 24, T=56 MALES: None FEMALES: 56 (100%) INCLUSION CRITERIA: adult (25-54years), Obese (BMI >30), no co-morbidities & other criteria (not full time college students, <150mins/week of moderate-intensity PA & <60mins/week of vigorous PA, not pregnant, answered 'no' to PA readiness questionnaire items) EXCLUSION CRITERIA: Not stated CO-MORBIDITIES: Not stated CO-MEDICATIONS: Not stated
Interventions	INTERVENTION: Use TTM SOC as algorithm to assign participant's SOC for PA, PA (pedometer, daily log, brochures, weekly email reminders). CONTROL: pedometer and weekly email reminders. DURATION OF INTERVENTION: 6 weeks DURATION OF FOLLOW-UP: at 6 weeks STUDY TERMINATED BEFORE REGULAR END: no
Outcomes	PRIMARY OUTCOME(S): no weight loss stated SECONDARY OUTCOMES: increased weekly time spent walking (p=0.002) in both groups; increased in daily steps from 6,419 steps SE 2386 steps (week1) to 7984 steps SE 2742 steps (p<0.001) in I & C groups combined ADDITIONAL OUTCOMES: move to one TTM stage (53.6%), regressed one stage (5.4%) and maintained at same stage (41.1%); progression to at least one TTM stage (p<0.001) for I & C groups combined
Publication	LANGUAGE: English TYPE: Peer review full article FUNDING: Not stated
Risk of bias	ADEQUATE SEQUENCE GENERATION: Unclear. Quote: "Participants were randomly assigned..." Comment: no other details given ALLOCATION CONCEALMENT: Unclear. Comment: Method of concealment is not described BLINDING: High risk. Comment: No information is given INCOMPLETE OUTCOME DATA: Low risk. Quote: "18 were excluded from analysis because they dropped out (n=13), had missing data (n=3), or had extreme values (n=2). Baseline characteristics did not differ between participants dropped from analysis and those included (p > 0.05, n=56)" SELECTIVE REPORTING: Unclear. Comment: The study protocol is available but the primary and secondary outcomes are not pre-specified OTHER BIAS: Unclear. Comment: No other details given to assess whether an important risk of bias exists
Study	Johnson 2008
Methods	DESIGN: RCT; Parallel; Randomisation ratio 1:1
Participants	COUNTRY: USA SETTING: Nationwide; personal (not reported), home based (using telephone and mail) I=628, C= 649, T=1277 MALES: 672 (53%) FEMALES: 605 (47%) INCLUSION CRITERIA: adults (18-75 years), overweight & Obese (BMI 25-39.9) EXCLUSION CRITERIA: age (under 18 or over 75), BMI below 25 or above 39.9 & other criteria (heart attack in previous three months, angioplasty in previous three months, heart failure, surgery in previous three months, eating disorder, cancer, pregnant or nursing, participation in formal or commercial weight management programme, not in a pre-action stage for healthy eating and/or exercise) CO-MORBIDITIES: Not stated CO-MEDICATIONS: Not stated
Interventions	INTERVENTION: Use TTM SOC as assessment and feedback construct for diet (healthy eating - reducing dietary fat to 30% of calories & calories reduction of 500 calories per day) & PA (moderate exercise - at least 30 min on 5 days per week); managing emotional stress without eating (using healthy strategies rather than eating to cope); 4 series of individual reports at baseline, 3, 6, & 9 months)

	<p>CONTROL: Usual care (no details stated) DURATION OF INTERVENTION: 9 months DURATION OF FOLLOW-UP: 12 & 24 months STUDY TERMINATED BEFORE REGULAR END: not stated</p>
Outcomes	<p>PRIMARY OUTCOME (S): In healthy eating + exercise groups – self-reported absolute weight loss in I group was more than C group (t1614, 2.12kg, p<0.05, df 0.17) at 24 months. In healthy eating group – weight loss of at least 5% of body weight was higher in I (27.4%) vs C (20.3%) (t11119=2.07, p<0.05, OR 1.22, 95% CI 1.01 to 1.48) at 24 months. In exercise behaviour - weight lost 5% or more was high in I (28.8%) than C (19.4%) (t1711=1.96, p=0.05, OR 1.32, 95% CI 0.99 to 1.75) at 24 months. In both healthy eating + exercise behaviours - weight lost 5% or more was higher amongst participants in I (30%) vs C (18.6%) groups at 24 months (t1615=2.05, p<0.05, OR 1.35, 95% CI 1.01 to 1.81) SECONDARY OUTCOMES: In healthy eating behaviour - more participants progressed to action or maintenance stage in I group versus C at 6 (43.9% vs 31.3%), 12 (43.10% vs 35.2%) and 24 months (47.5% versus 34.3%). The overall group effect for all time points (t11119=5.02, p<0.001, OR 1.61, 95% CI 1.33 to 1.94). In fruit and vegetable consumption behaviour - greater fruit and vegetable consumption amongst participants in I group than C group at 6 (44% vs 31.4%), 12(45.3% vs 39.6%) and 24 months (48.5% vs 39.0%). The overall group effect at all time points (t1856=5.01, p<0.0001, OR 1.63, 95% CI 1.34 to 1.97) ADDITIONAL OUTCOMES: management of emotional distress was higher in I group compared with C group at 6 (44% vs 25.3%), 12 (45% vs 38.3%), and 24 months (49.7% vs. 30.3%)</p>
Publication	<p>LANGUAGE: English TYPE: Peer review full article FUNDING: Non-commercial (NHLBI grant)</p>
Risk of bias	<p>ADEQUATE SEQUENCE GENERATION: Unclear. Quote: “Overweight or obese adults were randomized to no-treatment control or home-based” Comment: No other details given ALLOCATION CONCEALMENT: Unclear. Comment: Method of concealment is not described BLINDING: High risk. Comment: No information on blinding method is given INCOMPLETE OUTCOME DATA: Low risk. Quote: “Multiple imputation was used to estimate missing data for the 6, 12, and 24 month assessments....” SELECTIVE REPORTING: High risk. Comment: The study protocol not available and some outcomes data was not completely reported OTHER BIAS: High risk. Comment: Self-reported information gathering amongst participants may have subjected the trial to recall bias</p>
Study	Jones 2003
Methods	DESIGN: RCT; Factorial; Randomisation ratio not stated
Participants	<p>COUNTRY: Southern Ontario, Nova Scotia (Canada) SETTING: General diabetes population; delivered by investigators and health care professionals (counsellors, family physicians), using mail and telephone call I=529, C= 500, T=1029 MALES: 535 (52%) FEMALES: 494 (48%) INCLUSION CRITERIA: adult (age not reported), male and female, BMI more than 27 & other criteria (enrolled in healthy eating intervention, in pre-action stage for health - diet more than 30% fat) EXCLUSION CRITERIA: not stated & others (on diet therapy alone, if could not respond to English, if required more than usual care, no telephone) CO-MORBIDITIES: T1 & T2 diabetes CO-MEDICATIONS: insulin or oral antihyperglycemic</p>
Interventions	<p>INTERVENTION: 1) PTC: Use of TTM SOC to assign and assess stage of change (staged matched PTC, assess at baseline, 3, 6, 9 & 12 months), self-help manuals for diabetes, monthly newsletters & telephone counselling, staged-based personalized assessment report quarterly, Diet (assessment of intake). 2) PTC + blood test strips CONTROL: 1) Usual diabetes treatment (regular family physician visits, diabetes education sessions as prescribed). 2) Usual diabetes treatment + blood test strips DURATION OF INTERVENTION: 12 months DURATION OF FOLLOW-UP: 3, 6, 9 & 12 months, no follow up after end of intervention STUDY TERMINATED BEFORE REGULAR END: no</p>
Outcomes	PRIMARY OUTCOME(S): in SMBG + healthy eating groups - significant weight loss in action stage (individuals are ready to change their behaviour) versus pre-action stage (individuals are

	<p>not ready to change behaviour) for PTC (1.78kg vs 0.26kg, $p<0.01$) at 12 months. No information given for usual diabetes treatment</p> <p>SECONDARY OUTCOMES: In healthy eating group - lower calories from fat for PTC versus usual diabetes treatment (35.34% versus 36.1%, $P<0.004$) at 12 months; significant increased among participants taking up healthy eating behaviour (consuming diet with less than 30 percent of fat) in I group (32.5%) versus C (25.5%) group ($P<0.004$) at 12 months; significant increased servings of fruit per day for PTC vs usual diabetes treatment (OR 1.89 vs OR 1.68, $P<0.01$); and higher vegetables servings for PTC vs usual diabetes treatment (OR 2.24 vs OR 2.06, $P<0.011$)</p> <p>ADDITIONAL OUTCOMES: In SMBG - more participants progressed to action stage in I group (PTC + blood test strips= 43.4%, usual diabetes treatment + blood test strips= 27%) vs C group (PTC= 30.5%, treatment as usual= 18.4%) ($p<0.001$) at 12 months.</p> <p>In healthy eating behaviour - greater proportion of participants moved to action or maintenance in I group (32.5%) vs C group (25.8%), ($p<0.001$) at 12 months</p>
Publication	<p>LANGUAGE: English</p> <p>TYPE: Peer review (full article)</p> <p>FUNDING: Commercial (LifeScan, a Johnson & Johnson Company)</p>
Risk of bias	<p>ADEQUATE SEQUENCE GENERATION: Unclear risk. Quote: "Participants were stratified according to whether or not they took insulin or oral agents alone and were then randomized into treatment or strips conditions". Comment: No detail is given on the method</p> <p>ALLOCATION CONCEALMENT: Unclear risk. Comment: Method of concealment is not described</p> <p>BLINDING: High Risk. Comment: The study did not give information on blinding method</p> <p>INCOMPLETE OUTCOME DATA: Low risk. Quote: "Participants who did not complete the entire 12 months of the study did not have different baseline demographic characteristics from those who did complete the study...based on intention-to-treat (ITT) analysis..."</p> <p>SELECTIVE REPORTING: High risk. Comment: The primary outcomes data was not completely reported</p> <p>OTHER BIAS: High risk. Quote: "Successful results of this project may lead to the development of products by LifeScan, which may result in royalties to contributing authors and developers of such products, as well as their employers, the University of Rhode Island"</p> <p>Comment: The commercial source of funding of the study may contribute to risk of bias</p>
Study	Logue 2005
Methods	DESIGN: RCT; Parallel; Randomisation ratio 1:1
Participants	<p>COUNTRY: Ohio, USA</p> <p>SETTING: 15 primary care practices; delivered by Weight loss advisor and dietician; Telephone-based</p> <p>I=329, C= 336, T=665</p> <p>MALES: 30% (I) and 33% (C)</p> <p>FEMALES: not reported</p> <p>INCLUSION CRITERIA: adult (40-69 yrs), BMI> 27, Waist-to-hip ratio >0.95 for men or >0.80 for women.</p> <p>EXCLUSION CRITERIA: age & BMI not stated & other criteria (no access to a telephone, difficulty understanding eighth-grade level spoken or written English, pregnancy, lactation, <6 months postpartum, use of a wheel chair for mobility, severe heart or lung disease)</p> <p>CO-MORBIDITIES: Hypertension, hypercholesterolaemia, osteoarthritis, stomach problems, diabetes.</p> <p>CO-MEDICATIONS: psychotropic medication</p>
Interventions	<p>INTERVENTION: TTM SOC used as framework for intervention and assessment. TM-CD: Psychosocial evaluation (anxiety, depression and binge eating disorder) 6 monthly; SOC assessment for five target behaviours (increased exercise, increased usual activity, increased dietary portion control, decreased dietary fat and increased fruits and vegetables) every 2 months; assessment on anthropometric, dietary & exercise 6 monthly; 10min counselling on diet; prescriptions (dietary & exercise); monetary reward for completing each post baseline assessment</p> <p>CONTROL: Augmented usual care; assessment on anthropometric; dietary & exercise 6 monthly; 10min counselling on diet; prescriptions (dietary & exercise); monetary reward for completing each post baseline assessment</p> <p>DURATION OF INTERVENTION: 24 months</p> <p>DURATION OF FOLLOW-UP: 6, 12, 18 & 24 months</p> <p>STUDY TERMINATED BEFORE REGULAR END: no</p>
Outcomes	<p>PRIMARY OUTCOME(S): Early mean weight loss greater in I group 0.5kg (SE=0.4kg) vs C group at 6 and 12 months; higher mean weight loss in I group (-0.39kg, SE 0.38kg, 95% CI -1.1 to 0.4) vs C group (-0.16kg, SE 0.42kg, 95% CI -1.0 to 0.7) and weight loss difference was 0.23kg ($p=0.50$, 95% CI -1.4 to 0.9); weight mean change for I group and C group combined</p>

	<p>was -0.29kg (95% CI -0.9 to 0.3) at 24 months; No significant mean waist girth change for I group vs C group; decreased in mean waist girth for I group and C group combined (1.7cm SE 0.4 cm, P = 0.0001) at 24 months; Weight gain in I and C groups combined was significant (p<0.0001) after 12 months (adverse event) SECONDARY OUTCOMES: no significant mean energy intake per day in I group compared to C group (p=0.69) at 24 months; a significant reduction in the mean of energy intake per day for I and C groups combined (~250kcal/d, p<0.0001) throughout the 6 to 24 months; mean energy expenditure for I group compared to C group not significant (P=0.31); energy expenditure mean increased (~2kcal/kg per day, P=0.04) for I and C groups combined at 24 months; significant increase in the mean of self-reported exercise minutes per week in I versus C groups (P=0.008) from 6 to 24 months and the mean difference between I and C groups was 31.5 minutes (SE 12 minutes) ADDITIONAL OUTCOMES: Mean blood lipid showed no difference. Mean blood pressure showed no difference.</p>
Publication	<p>LANGUAGE: English TYPE: Peer review (full article) FUNDING: Non-commercial (Agency for Healthcare Research and Quality and the National Institute of Diabetes, Digestive, and Kidney Diseases Grants, Nutrition and Exercise Studies grants from the Summa Health System Foundation)</p>
Risk of bias	<p>ADEQUATE SEQUENCE GENERATION: Low risk. Quote: "The Office of Biostatistics prepared the ordered randomization tickets using permuted blocks of 10" ALLOCATION CONCEALMENT: Low risk. Quote: "Participants were randomised by opening an envelope with a set of ordered tickets indicating "TM-CD" or "Traditional" care. A separate randomization sequence was used for each primary care practice site" BLINDING: Low risk. Quote: "Participants and research staff at each practice were blind to the assignment of patients while obtaining baseline measures, because assignment envelopes were not opened until the end of the visit" INCOMPLETE OUTCOME DATA: Unclear risk. Quote: "The majority of missing values occurred because participants declined further participation when an effort was made to schedule a follow-up appointment. 3 patients died during follow-up" SELECTIVE REPORTING: High risk. Comment: The study protocol not available and some outcomes data was not completely reported OTHER BIAS: High risk. Comment: Self-reported information gathering amongst participants may have subjected the trial to recall bias</p>
Study	Stephoe 2001
Methods	DESIGN: RCT; Parallel; Randomisation ratio not stated
Participants	<p>COUNTRY: United Kingdom SETTING: 20 General practices; delivered by Practice Nurse and Health Educators; GP surgery setting I=316, C= 567, T=883 MALES: 406 (46%) FEMALES: 477 (54%) INCLUSION CRITERIA: adult (age not reported), male and female, Obese (BMI 25-35) & other criteria (have risk factors - cigarette smoking more than 1 cigarette per day, high cholesterol (6.5-9.0 mmol/L or combination of high BMI, PA <12 episodes in the past 4 weeks of vigorous or moderate exercise lasting 20 minutes) EXCLUSION CRITERIA: age & BMI not stated & other criteria (on active medical follow-up, on medication for CHDs, history of cardiovascular diseases, serious chronic illness, prescribed a special diet or lipid lowering drugs) CO-MORBIDITIES: not stated CO-MEDICATIONS: not stated</p>
Interventions	<p>INTERVENTION: TTM SOC used as algorithms to assign and assess participant's (reducing dietary fat intake, stop smoking & increase PA). Behavioural lifestyle counselling; baseline assessment of soc; counselling (fat intake reduction, PA) based on no. of risk factors (2 given 3 counselling sessions & 1 given 2 counselling sessions) after 4 months and 12 months. CONTROL: Usual health promotion; education on healthy life style, encouragement and advice DURATION OF INTERVENTION: 4 months DURATION OF FOLLOW-UP: 4 & 12 months. STUDY TERMINATED BEFORE REGULAR END: not stated</p>
Outcomes	<p>PRIMARY OUTCOME(S): not weight loss stated SECONDARY OUTCOMES: Increased readiness to reduce fat intake in I (67.1%, 95% CI=56.7,76.1) vs C (53.6%, 95% CI=45.8,61.3) groups at 4 months (OR 2.15, 95% CI 1.30 to 3.56); and at 12 months in I group (68.4%, 95% CI 61.1 to 74.8) vs in C group (59.2%, 95% CI</p>

	<p>49.2 to 68.6) (OR 1.26, 95% CI 0.73 to 2.18) Increased readiness to exercise in I group (32.2%, 95% CI 23.7 to 42.0) vs C group (23.9%, 95% CI 17.8 to 31.2) at 4 months (OR 2.5, 95% CI 1.30 to 3.56); and at 12 months in I group (30.6%, 95% CI 21.8 to 41.2) vs C group (28.9%, 95% CI 24.0 to 34.3) (OR 1.68, 95% CI 1.08 to 2.61) ADDITIONAL OUTCOMES: For fat reduction behaviour, progression to action or maintenance stage in I group vs C was OR 2.15 (95% CI 1.30 to 3.56) at 4 months, and OR 1.26 (95% CI 0.73 to 2.18) at 12 months. For PA, progression to action or maintenance stage in I group vs C group was OR 1.89 (95% CI 1.07 to 3.36) at 4 months, and OR 1.68 (95% CI 1.08 to 2.61) at 12 months. For smoking cessation, progression to action/maintenance stage in I vs C was OR 1.77 (95% CI 0.76 to 4.14) at 4 months, OR 1.49 (95% CI 0.56 to 4.00) at 12 months</p>
Publication	<p>LANGUAGE: English TYPE: Peer review (full article) FUNDING: Non-commercial (NHS R&D Programme in Cardiovascular disease & stroke)</p>
Risk of bias	<p>ADEQUATE SEQUENCE GENERATION: Unclear risk. Quote: "Twenty general practices were randomised to lifestyle counselling by behavioural methods or to causal health promotion". Comment: No other detail is given ALLOCATION CONCEALMENT: Unclear risk. Comment: Method of concealment is not described BLINDING: High risk. Comment: No information on blinding method is given INCOMPLETE OUTCOME DATA: Unclear Comment: No information is reported on missing data, lost to follow up or attrition rate SELECTIVE REPORTING: Low risk. Comment: All of the study's pre-specified primary outcomes have been reported OTHER BIAS: High risk. Comment: Self reported data collection from participants may introduced recall bias in the trial</p>
<p><i>Footnotes</i> C: control; I: intervention; PA: PA; PTC: pathways to change; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; T: total sample size; TTM: transtheoretical model</p>	

Appendix 5: Characteristics of excluded studies

Study	Reasons for exclusion
Annunziato 2009	RCT using Cognitive Behaviour Therapy as framework for intervention
Bennett 2010	RCT using self-efficacy theory and obesogenic behaviour change principles as framework for intervention
Bibeau 2008	RCT with children as participants included
Blalock 2002	RCT with participants' BMI status not specified
Bonner 1997	Non-Randomized Experimental design with participants' BMI not stated.
Burke 2002	RCT with unspecified theoretical framework for intervention
Chin 2002	RCT with participants' BMI less than or equal to 25 and TTM SOC not used as framework for intervention
Coday 2002	RCT using social action theory as framework for intervention
Dallow 2003	RCT using TTM SOC and self-efficacy theory as frameworks for intervention
De Vet 2007	RCT with non-overweight and obese participants included in the study
Demark-Wahnefried 2008	RCT using SCT as framework for intervention
Digenio 2009	RCT using behaviour treatment strategies as framework for intervention
Donnelly 2008	RCT TTM SOC is not used as framework of intervention
DPPRG 2009	Randomized clinical trial using lifestyle curriculum strategies as framework for intervention
Eriksson 2009	RCT using TTM SOC as framework for intervention with normal weight participants included
Feldman 2000	RCT with participants' BMI status not specified
Finckenor 2000	Non-randomized Experimental design with non-equivalent control group and participants' BMI status not stated
Folta 2009	RCT using SCT as framework for intervention and participants with normal weight included
Fox 2009	RCT using SCT as framework for intervention
Frisch 2009	RCT using telemedicine principles as framework for intervention
Gill 1998	Non-randomized Experimental design using biopsychosocial model as framework for intervention
Glanz 1994	Cross-sectional prospective study
Greene 1998	RCT with normal weight participants included in the study
Gusi 2008	RCT using no explicit behaviour model or theory as framework for intervention
Hersberger 2006	Prospective evaluation study with no intervention and control group, using diabetes risk assessment and TTM SOC as framework for intervention
Huisman 2009	RCT using self-regulation principles as framework for intervention
Irwin 2004	RCT using TTM SOC and self efficacy as theoretical frameworks for intervention and participants with normal weight included
Jeffery 1999	A follow up prospective study design of a RCT study with participants within normal BMI range
Jeffery and French 1999	RCT with no theoretical model use as framework for intervention
Jimmy 2005	RCT with normal weight participants aged below 18 included in the study
Johnson 2006	RCT with undefined participants' weight categories
Jones 2005	Prospective study using self efficacy and TTM SOC as framework for intervention
Jonsson 2009	RCT using Paleolithic diet principles framework for intervention
Kallings 2009	RCT using SCT, TTM SOC, motivational interviewing and supportive environment as theoretical frameworks for intervention
Kelly 2005	Cross-sectional study with TTM SOC and decisional balance theory as framework for intervention
Kennedy 2009	RCT using unspecified theoretical framework for intervention
Keranan 2009	RCT using effective counselling principles as theoretical framework for intervention
Kirk 2003	RCT with normal weight participants included in the study
Kris-etherton 2002	RCT using unspecified theoretical framework for intervention
Laforge 1994	Cross-sectional study using TTM SOC as framework for intervention
Latka 2009	RCT using TTM SOC as framework for intervention with normal weight participants included
Lee 1996	Non-randomized prospective experimental study with participants' BMI status not stated
Lee 2009	RCT using counselling principles as frameworks for intervention
Ma 2009	RCT using TTM SOC and SCT as theoretical frameworks for intervention

Study	Reasons for exclusion
Macrodimitris 2005	Descriptive study as part of a larger RCT which only looked at preliminary assessment phase prior to randomisation to intervention groups and participants with normal weight and obese included
Mardones 2009	Cross-sectional descriptive study to assess participants' TTM SOC
Martin 2007	RCT using SCT and TTM SOC
McTiernan 1999	RCT using Cognitive-Behavioural Skills Framing and TTM SOC as theoretical frameworks for intervention
Merriam 2009	RCT using SCT as framework for intervention
Morgan 2009	RCT using SCT as framework for intervention
Nanchahal 2009	RCT using unspecified theoretical framework for intervention
Oden 2005	Experimental study with underweight and normal weight participants included in the study
Ostbye 2009	RCT using SCT, Stages of Readiness and motivation models as frameworks for intervention
Ostendorf 1998	Cross-sectional exploratory descriptive study
O'Connell 1988	Cross-sectional study with participants' BMI status not specified
Parra 2010	RCT using TTM SOC & SCT as framework for intervention with normal weight participants included
Partick 2009	RCT using behavioural and dietary strategies as framework for intervention
Pekmezi 2009	RCT using TTM SOC and SCT as framework for intervention
Pettman 2009	RCT using unspecified theoretical framework for intervention
Pinto 2002	RCT using TTM SOC and SCT as framework for intervention
Pinto 2005	RCT with normal weight participants included
Prestwich 2010	RCT using Intention Behaviour Gap theory and Theory of Goal Systems as frameworks for intervention, and normal weight participants included
Prochaska 2008	RCT with normal weight participants included
Provencher 2009	RCT using health-centred approach as framework for intervention
Retterstol 2009	Randomized cross-over study using dietary strategies as framework for intervention
Rimmer 2009	RCT using unspecified theoretical framework for intervention
Ritin 2009	RCT applying TTM SOC with normal weight participants included
Robinson 2007	RCT with normal weight participants included
Roesch 2010	RCT using TTM SOC & SCT as framework for intervention
Ross 2009	RCT using TTM SOC & SCT as framework for intervention
Sarkin 2001	Cross-sectional study design
Schelling 2009	RCT using Cognitive behavioural strategies as framework for intervention
Schumann 2006	RCT for smoking cessation
Siegel 2010	RCT using SCT and Self-efficacy theory as framework for intervention
Silva 2008	RCT using self-determination theory as framework for intervention
Silva 2010	RCT using self-determination theory as framework for intervention
Smith 2007	Cross-sectional study design
Sutton 2003	A trial's baseline assessment study
Vallis 2003	Cross-sectional study comparing patients at entry into an intervention trial
Van 2002	RCT with normal weight participants included in the study and a duplicate publication.
Vazquez 2009	RCT using unspecified theoretical framework for intervention
Verheijden 2004	RCT with normal weight participants included
Verveka 2003	RCT with normal weight participants included in the study
Waddden 2009	RCT using unspecified theoretical framework for intervention
Webber 2010	RCT using self-efficacy theory and motivational interviewing principles as framework for intervention
Wee 2005	Cross-sectional design with normal weight, overweight and obese participants are included
White 2004	RCT using unspecified theoretical framework for intervention and participants included is adolescents
Williamson 2010	RCT using behaviour modification methods as framework for intervention
Wing 2010	RCT using Social Learning Theory as theoretical frameworks for intervention
Yassine 2009	RCT using unspecified theoretical framework for intervention
<i>Footnotes</i>	
BMI: body mass index; RCT: randomised controlled trial; SOC: stages of change; SCT: social cognitive theory TTM: transtheoretical model	

Appendix 6: The matrix of study endpoints

Study ID/ Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 200
Intervention(s) & control(s)	I: pedometer + TTM SOC C: pedometer only	I: SOC + diet, physical activities + stress management C: usual care	I1: PTC I2: PTC + blood test strips C1: usual diabetes treatment C2: usual diabetes treatment + blood test strips	I: TM-CD C: augmented usual care	I: behavioural lifestyle counselling C: usual health promotion
Primary ¹ endpoint(s):	change in walking steps (frequency & duration), change in TTM scores	healthy eating, exercise, managing emotional stress & fruits and vegetables intake	readiness to change, increases in self-care, improved diabetes control	weight change	readiness to reduce dietary fat, increase physical activities & smoking cessation
Secondary ² endpoint(s)	none	none	none	none	none
Other ³ endpoint(s)	SOC progression	weight loss, SOC progression (action/maintenance)	weight loss, decreased calories (fat), increase fruits and vegetables servings, SOC progression	change in energy intake, energy expenditure, self reported exercise, blood pressure & blood lipids	none
<p><i>Footnotes</i> ^{1,2} as stated in the publication; ³ not stated as primary or secondary endpoint(s) in the publication C: control; I: intervention; None: not reported; PTC: pathways to change; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; TTM: transtheoretical model</p>					

Appendix 7: Adverse events in the included studies

Study ID/ Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 200
Intervention (I): Application of TTM Control (C): Usual advice on diet and/or exercise	I: pedometer + TTM SOC C: pedometer only	I: SOC + diet, physical activities + stress management C: usual care	I1: PTC I2: PTC + blood test strips C1: usual diabetes treatment C2: usual diabetes treatment + blood test strips	I: TM-CD C: augmented usual care	I: behavioural lifestyle counselling C: usual health promotion
Deaths [n / N]	none	I: 0 / 628 C: 1 / 649 Total: 1 / 1277	none	I: 3 / 329 C: 0 / 336 Total: 3 / 665	none
Adverse events: relapse into unhealthy behaviour and weight gain [n / %]	none	none	none	Weight gain (none)	none
Serious adverse events [n / %]	none	none	none	none	none
Drop-outs due to adverse events [n / %]	none	none	none	none	none
Hospitalisation [n / %]	none	none	none	none	none
Out-patient treatment [n / %]	none	none	none	none	none
Symptoms [n / %]	none	none	none	none	none
<i>Footnotes</i> C: control; I: intervention; None: not reported; PTC: pathways to change; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; TTM: transtheoretical model					

Appendix 8: Primary and secondary outcomes

Study ID/ Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 200
Intervention (I): Application of TTM Control (C): Usual advice on diet and/or exercise	I: pedometer + TTM SOC C: pedometer only	I: SOC + diet, physical activities + stress management C: usual care	I1: PTC I2: PTC + blood test strips C1: usual diabetes treatment C2: usual diabetes treatment + blood test strips	I: TM-CD C: augmented usual care	I: behavioural lifestyle counselling C: usual health promotion
Data for primary outcomes of this Cochrane review					
Weight-loss maintenance	none	Absolute weight loss (healthy eating + exercise behaviours) at 24 months: I: none C: none T: none The treatment group weight lost vs control at 24 months: t(1 615), -2.12kg, p<0.05, df 0.17) At least 5% of body weight for healthy eating behaviour at 24 months: I: 27.4% C: 20.3% T: none The overall effect over time: t(11119), 2.07kg, p<0.05, OR 1.22 (95% CI 1.01 to 1.48) Weight lost 5% or more for exercise behaviour at 24 months: I: 28.8% C: 19.4% T: none The overall effect with increasing differences overtime: t(1711), 1.96kg, p=0.05, OR 1.32 (95% CI 0.99 to 1.75) Weight lost 5% or more for (healthy eating + exercise behaviours) at 24 months: I: 30% C: 18.6% T: none	In healthy eating group (at 12 months): I: 1.38kg (action stage) C: none T: none Both SMBG & healthy eating groups (at 12 months): I: 1.78kg (action stage) C: none T: none (p<0.01)	Early mean weight loss (6 and 12 months): I: 0.5kg (SE 0.4) C: none T: none (p<0.0001) Mean weight loss (at 24 months): I: -0.39kg (SE 0.38kg, 95% CI -1.1 to 0.4) C: -0.16kg (SE 0.42kg, 95% CI -1.0 to 0.7) T: -0.29kg (95% CI -0.9 to 0.3)	none

Study ID/ Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 200
		The overall group effect for intervention had increased overtime t(1615), 2.05kg, p<0.05, OR 1.35 (95% CI 1.01 to 1.81)			
Health-related quality of life	none	none	none	none	none
Data for secondary outcomes of this Cochrane review					
Self-reported change in dietary habit and measured change in dietary habit	none	<p>Increased healthy eating behaviour (reduce calories intake per day) at 6 months: I: 43.9% C: 31.3% T: none</p> <p>At 12 months: I: 43.10% C: 35.2% T: none</p> <p>At 24 months: I:47.5% C:34.3% T:5.02, p<0.001, OR 1.61 (95% CI 1.33 to 1.94)</p> <p>The overall group effect for all time points t(1,1119), 5.02, p<0.001, OR 1.61 (95% CI 1.33 to 1.94)</p> <p>Greater fruit and vegetables intake (progression to action/maintenance) at 6 months: I: 44% C: 31.4% T: none</p> <p>At 12 months: I: 45.3% C: 39.6% T: none</p> <p>At 24 months: I:48.5% C:39.0% T: none</p> <p>The overall group effect for all time points t(1856), 5.01, p<0.0001, OR 1.63 (95% CI 1.34 to 1.97)</p>	<p>Lower calories intake from fat in healthy eating behaviour at 12 months: I:35.34% C:36.1% T: none (P<0.004)</p> <p>Higher vegetable intake per day I:2.24 C:2.06 T: none (P<0.011)</p> <p>Higher Fruit servings intake I:1.89 C:1.68 T: none (P<0.011)</p>	<p>Decreased in mean energy intake per day at 6 to 24 months: I: none C: none T:~250kcal/d (p<0.0001)</p> <p>Increased in mean energy expenditure per day at 24 months: I:none C:none T:~2kcal/kg per day (p=0.04)</p>	<p>Readiness to reduce fat intake (for action/maintenance stage) at 4 months: I:67.1% (95% CI 56.7 to 76.1) C:53.6% (95% CI 45.8 to 61.3) T:OR 2.15 (95% CI 1.30 to 3.56)</p> <p>Readiness to reduce fat intake (for action/maintenance stage) at 12 months: I: 68.4% (95% CI 61.1 to 74.8) C:59.2% (95% CI 49.2 to 68.6) T: OR 1.26 (95% CI 0.73 to 2.18)</p>
Self-reported uptake in PA and measured change in PA	Increased total daily steps increased at 6 weeks:	Increased exercise habit (progression to action/maintenance stage) at 6 months: I:43%	none	Increased in mean self-reported exercise minutes per	Increased readiness to exercise (for action/maintenance stage) at 4 months: I:32.2% (95% CI

Study ID/ Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 200
	I: none C: none T: 7984, SE 2742 (p<0.0001) Increased weekly walking time (minutes) at 6 weeks: I:none C: none T:145 (median), p<0.001	C:34.6% T: none Increased exercise habit (progression to action/maintenance stage) at 12 months: I:37.7% C:35.9% T: none Increased exercise habit (progression to action/maintenance stage) at 24 months: I:44.9% C:38.1% T: none		week (from 6 to 24 months): I:none C:none T:31.5 min (MD), SE 12min (p=0.008)	23.7 to 42.0) C:23.9% (95% CI)7.8 to 31.2) T:OR 1.89 (95% CI 1.07 to 3.36) Increased readiness to exercise (for action/maintenance stage) at 12 months: I:30.6% (95% CI 21.8 to 41.2) C:28.9% (95% CI 24.0 to 34.3) T:OR 1.68 (95% CI 1.08 to 2.61)
Change in weight loss measures	none	none	none	Decreased in mean waist girth (at 24 months): I:none C: none T: 1.7cm, SE 0.4cm (p=0.0001)	none
Progression through SOC	Moved forward at least one stage at 6 weeks: I:none C:none T:53.6% (p<0.001) Maintained existing stage at 6 weeks: I:none C:none T:41.1%	Progressed to action or maintenance stage for healthy eating outcome at 6 months: I: 43.9% C: 31.3% T: none At 12 months: I: 43.10% C: 35.2% T: none At 24 months: I: 47.5% C:34.3% T: none The overall group effect for all time points: t(11119), 5.05, p<0.001, OR 1.61, 95% CI 1.33 to1.94 Progressed to action or maintenance stage for exercise outcome at 6 months: I: 43% C: 34.6% T: none At 12 months: I: 37.7% C: 35.9% T: none At 24 months: I: 44.9% C: 38.1% T: none The overall group effect for all time points: t(1711), 2.25, p<0.05, OR 1.27, 95% CI 1.03	Progressed to action stage in SMBG at 12 months: I1:30.5% C1:18.4% I2:43.4% C2: 27% T: none (p<0.001) Progressed to action stage for healthy eating behaviour at 12 months: I1:32.5% C1:25.8% T: none (p<0.001)	none	Progressed to action or maintenance stage for fat reduction habit at 4 months: I:none C: none T: OR 2.15 (95% CI 1.30 to 3.56) Progressed to action or maintenance stage for fat reduction habit at 12 months: I:none C: none T: OR 1.26 (95% CI 0.73 to 2.18) Progressed to action or maintenance stage at for PA at 4 months: I:none C: none T: OR 1.89 (95% CI 1.07 to 3.36) Progressed to action or maintenance stage at for PA at 12 months: I:none C: none T: OR 1.68 (95% CI 1.08 to 2.61)

Study ID/ Characteristic	Dinger 2007	Johnson 2008	Jones 2003	Logue 2005	Stephoe 200
		to 1.57 Progressed to action or maintenance stage for fruit & vegetable outcome at 6 months: I: 44% C: 31.4% T: none At 12 months: I: 45.3% C: 39.6% T: none At 24 months: I: 48.5% C: 39.0% T: none The overall group effect at all time points: t(1856), 5.01, p<0.0001, OR 1.63, 95% CI 1.34 to 1.97			
Adverse events	Regressed one stage at 6 weeks: I:none C:none T:5.4%	none	none	Weight gain after 12 months: I: none C:none T: none (p<0.0001)	none
Morbidity	none	none	none	none	none
Death from any cause	none	I:none C:1 T:1	none	I:3 C:none T:3	none
Costs	none	none	none	none	none
<i>Footnotes</i> C: control; I: intervention; None: not reported; PTC: pathways to change; SMBG: self monitoring blood glucose; SOC: stages of change; TM-CD: transtheoretical model-chronic disease; TTM: transtheoretical model					

Appendix 9: Obesity strategy for PCTs in North West London

NO	PCT	STRATEGY AVAILABLE		
		Adult	Teenage (13-19 years)	Children (below 12 years)
1	WESTMINISTER	<p>Yes (community and workplace based) Improve access to healthy foods at affordable prices, access to healthy eating information and advice, reduce access to foods high in sugar and fat through vending machines in workplaces, promote breastfeeding among women (148). Physical exercise strategies for older people (Exercise Referral Scheme, Soho Centre for Health runs exercise, exercise classes and CHD Wednesday Walking Group) (149)</p>	<p>Yes (schools based) Healthy School Programme (e.g. free school meals and HE) (150) Improve quality of school dinners and other meals, reduce access to foods high in sugar and fat through vending machines in schools (148)</p>	<p>Yes (community based) Healthy living centre, Sure start programme & Children's Centres (150)</p>
2	BRENT	<p>Yes (community and primary care based). Diabetic management (HE and treatment) (151) Sports strategy scheme (physical activities interventions). Healthy walking programme (152)</p>	<p>Yes (community and schools based). School Sports and Club Links Strategy programme (physical education, sports competition and 'Step Into Sport Initiative' (152)</p>	<p>Yes (primary care based) Breast feeding and healthy diet (153)</p>
3	HARROW	<p>Yes (community and primary care based) Diet and Physical activities interventions. X-PERT programme focus on patient education & clinical management of diabetes (154) A 'Walk This Way' PA programme has trained walk leaders to increase PA (155)</p>	<p>Yes (school-based) MEND Programme (Mind, Exercise, Nutrition, Do it) For ages 7-13 . A School Meals Strategy has been developed (155)</p>	<p>Yes (school-based) Recording of Height and Weight for reception and year 6 children. MEND Programme (Mind, Exercise, Nutrition, Do it) For ages 7-13 (154) . A School Meals Strategy has been developed (155)</p>
4	HILLINGDON	<p>Unknown</p>	<p>Yes (school-based) Physical activities & healthy eating. MEND programme (7-15 years old) (156)</p>	<p>Yes (school based) Physical activities & healthy eating. MEND programme (7-15 years old) (156)</p>
5	HOUNSLOW	<p>Yes (Community-based) Local Actions: Produce strategies to develop PA in schools & community settings: PA Strategy, Sports & Active Recreation Strategy, Walking Strategy, Community initiative Programme) (157) United4Kidz (family</p>	<p>Yes (School-based) Local Healthy Schools Programme – curriculum based HE for healthy choices, healthy eating & physical activities & healthy eating) (157). Local Actions: Food in Schools initiatives & 'Alive and</p>	<p>Yes (school & community based). Promoting breastfeeding. Healthy Start Scheme (Play Centres), Healthy Schools Scheme (diet education and physical exercise), Healthy Hearts Programme (Sports/Physical exercise), Kathak Dance Classes – Watermans (for children aged 12 and over). One to one dieticians</p>

NO	PCT	STRATEGY AVAILABLE		
		Adult	Teenage (13-19 years)	Children (below 12 years)
		based healthy eating and physical activities interventions), Green routes in Hounslow (six signposted walking routes & public transport information – physical exercise), CIP (leisure card scheme), Heartbeat Award “smoke free seats and healthy eats” (healthy food education for food caterers), Diabetes-Education Groups (obesity treatment interventions) & ‘Weight to Lose’ (dietician led weight reduction support group) (158)	Kicking training (157). Healthy Living Blueprint for Schools (encourage a healthy lifestyle, use curriculum, ensure healthy food and drink available, physical education and school sport) – E.g. Extended School programme, Hounslow Healthy School Programme (PSHE) (157)	service (for children aged up to 16 years) (158) School fruit and vegetables Scheme Intake & Access to water (4-6 years old children). Local Actions: Produce strategies to develop PA in schools & community settings: Safer routes to schools: walk to School Wednesday, Lunchtime supervisors training in aspects of active play (primary/infant schools), Development of School travel plans, Cycle training for school children (157).
6	EALING	<p>Yes (community and primary care based) Prevention of CHD, diabetes and obesity (159) Choosing health programmes (PA for elderly and women). Health checks and diabetes awareness programme.</p> <p>Health promotion through media (159).</p> <p>5 Day programme (healthy eating activities including cookery clubs), family after school cookery club, healthy eating at work, healthy eating talks and cookery demonstrations for community groups). School health fairs (3 days providing information to parents on packing healthy food).Referral to cookery clubs (for overweight and obese patients). Launch of Hungry for health recipe book (159) (160)</p> <p>Diabetes management services at GP level including screening, HE, intervention and health professional trainings (159). Dietetics services (161)</p>	<p>Yes (school based) Healthy Schools Programme (with healthy eating and physical activities interventions) (159)</p>	<p>Yes (school based) Healthy Schools Programme, Weighing and measuring programme (159). The Grab 5! Programme (teaching healthy nutrition for 7-11 years), ‘Food in Schools’ programme and Breastfeeding (161) (160)</p>
7	HAMMERSMITH & FULHAM	<p>Yes (Community and primary care based) GP services for diabetes patients (screening, education, advice, support</p>		<p>Yes (School, community and primary care based) Weight management service in schools and primary/community care,</p>

NO	PCT	STRATEGY AVAILABLE		
		Adult	Teenage (13-19 years)	Children (below 12 years)
		and treatment), Raising awareness programme by outreach work and publicity (162)		MEND project for overweight children (162)
8	KENSINGTON & CHELSEA	Yes (Community and Primary Care based) Increase PA and improve nutrition in target groups, & HE (163). Establish nutrition action group and peer educators (food safety), Cook and Taste Programme. Walking alliance campaign (PA lead by voluntary groups). (164)	Yes (School and community based) Healthy School Programme (nutrition and PA) (164)	Yes (School, community and primary care based) Healthy Schools Programme, Healthy Starts Scheme (promote nutrition in young children). Improve breastfeeding (164)

Appendix 10: Description of Bardach's Eight-fold Path Framework

Steps	Description
1) Define the problem	Provides direction for evidence-gathering activity and structure of the final stage, i.e. telling the story. The problem definition comes from the client's perspective, derived from the political, social and institutional environment. Some issue labels may signify more than one problem. It may help to think of the problem in terms of deficit and excess. The 'problem' should be defined in an evaluative form and quantify it if possible using necessary information or estimate to calibrate the magnitude of the issue. It is sometimes useful to diagnose one or more alleged conditions that cause problems. Avoid defining the solution into the 'problem' and accepting too easily the causal claims implicit in diagnostic problem definitions.
2) Assemble some evidence	Includes reviewing documents and literature, using statistics as well as interviewing people. These activities are time-consuming. Therefore, it is essential to collect only those data that can be turned into 'information' that, in turn, can be converted into 'evidence' that has some bearing in the problem or issue. Evidence must be weighted for its likely cost against its likely value. In the process, there is possibility of using an educated guess and rethink about the issue to avoid collecting useless data. It is useful to survey 'best practices' and look at past solutions implemented by policy makers and extrapolate them as appropriate.
3) Construct the alternatives	Refers to making a list of all the alternatives course of action or alternative strategies of intervention to solve or mitigate the problem, that will be considered in the analysis stage. A good causal model is often quite useful for suggesting possible 'intervention points' in this phase, such as market, production and evolutionary model. Conceptualize and simplify the list of alternatives when making the final list of the alternatives. It is acceptable to design additional policy alternatives for the existing list, if needed.
4) Select the criteria	It can be more of evaluative than analytical nature. Evaluative criteria are the most important step for introducing values and philosophy into the policy analysis, because some possible 'criteria' are evaluative standards used to judge the goodness of the projected policy outcomes associated with each of the alternatives, and ultimately will resolve the policy problem to an acceptable degree. The commonly used evaluative criteria are efficiency, equality, equity, fairness, justice, freedom, community and process values. Practical criteria that are commonly used include legality, political acceptability as well as robustness and improvability
5) Project the Outcomes	Anticipating for each of the alternatives on the current list outcomes or impact which are relevant and important to the analyst or other interested party by 'being realistic'. It is necessary to extend the logic of projection by combining models and evidence to produce usable projections of policy outcomes attached to the various alternatives being considered. There is a need to provide a range to explain the magnitude of the estimates for the outcomes. Sensitive analysis techniques such as 'Monte Carlo simulation' may be use in the process to discover the 'most important' uncertainties for the alternatives. It is useful to apply the other-guy's-shoes heuristic (i.e. imagine yourself in the other guy's shoes) approach systematically for each of the important stakeholders or other affected parties. Policy analyst need to be cautious and anticipate common undesirable side effects in public programmes, for example moral hazards and overregulation. Outcomes matrix is practical way to get an overview of all the information presented at this stage.
6) Confront the Trade-offs	A process when one of the policy alternatives under consideration is expected to produce a better outcome than any of the other alternative, with regard to every single evaluative criterion, then one must clarify the trade-offs between outcomes associated with different policy options for the sake of the client and/or audience. The most common trade-off is between money and a good or service received by some proportion of the population. However, a common pitfall of this process is to think and speak of the trade-offs as being across alternatives rather than across projected outcomes. Some useful approaches in this stage are focus on outcomes, simplify the comparison process, eliminate weaker alternatives and compare to a base case.
7) Decide	Refers to checking on how well the analysis is done up to this stage and decide what to do next, then if problems arise, there are possibilities that the trade-offs have not been sufficiently described. At this point, the analyst must be able to convince oneself of the plausibility of some course of action, otherwise one will not able to convince the client or

Steps	Description
	stakeholders. It is useful to clarify the relevant trade-offs and leaving the decision completely up to the audience. There is a need to be cautious on the most common sources of failure, which is neglecting to consider the resistance of bureaucratic and other stakeholders in the status quo, and the lack of an entrepreneur in the relevant policy environment. The analogy is, 'If your favourite policy alternative is such a great idea, how come it's not happening already?'
8) Tell Your Story	The policy analyst attempt to explain the basic idea of the best chosen alternatives in satisfactorily simple and down-to-earth terms that someone will be able to carry on with the task. In this step, it is crucial to gauge the audience (s) as in understanding the appropriate way to approach the audience which will predict the future of the relationship. Political environment, advocacy context and segregate approach must be considered in telling the story to the audience (s). The common rules in this stage include consider the medium to use and give the story a logical narrative flow as well as avoiding some typical pitfalls such as following the 'Eightfold Path too closely' and showing off all the work.

Appendix 11: Description of Collin's Health Policy Analysis Framework

Steps	Description
1) Define the context	In every country, health policy reflects the political, economic and social pressures, as well as national values and priorities. Therefore, it is the first step to take in policy analysis to develop a comprehensive profile of a given country. The purposes are to provide the background information on the country that puts health policy in context, and to understand the socio-cultural determinants of health problems that consequently form the foundations for health policy analysis. The contextual factors which may be useful in this process include political system, geography, social and economic conditions.
2) State the problem	The next step is consistent with Bardach's first step of defining the health problem. This should be descriptive and diagnostic in nature and include data on a population's vital statistics (live births, deaths by age, sex and cause) as well as health statistics (morbidity by type, severity, outcome data and burden of disease data). The problem statement must be revisited in the policy analysis process to make sure that the problem will be successful targeted in the end.
3) Search for the evidence	Similar as assembling some evidence which refers as collecting data that have 'meaning' and can help identify significant features of the policy problem and its possible solutions. Beforehand, it is important to define the policy issue precisely. Literature review is a good starting point for the collecting the evidence and at times use of secondary data are sufficient to complete the analysis. The sources of information may include publications, policy documents, unpublished report, survey data and qualitative data.
4) Consider different policy options	Concerned with constructing the alternatives for reducing the problem. In analyzing the options, it is crucial to examine the linkages of the policy to the context. The options should also reflect the ethnic specificity and experience of the nation and be scientifically justified and based on international experience. In the process, it is important to consider the epidemiological, clinical and economic aspects of interventions. Policy analysts must be aware that choosing one alternatives implies forgoing another, and sometimes it means simply adding one more policy action that might resolve or lessen the health problem
5) Project the Outcomes	A process of considering the outcomes of the proposed alternative interventions and keeping in mind the concepts of 'benefit for few or for the greater good'.
6) Apply evaluative criteria	Applying a standard or criteria against the measured projected outcomes when evaluating the interventions. The choice of criteria depends on the problem under study. The 'Rodriguez-Garcia's five evaluative criteria' is the preferred criteria in this analysis, which comprise of relevance, progress, efficiency, effectiveness and impact.
7) Weight the outcomes	The policy analyst chooses between the projected outcomes of a particular intervention, rather than choosing between the alternatives, in this step. The alternatives should first be converted into outcomes before actual trade-offs can be tackled.
8) Make the decision	Defined as making a decision on a policy option by carefully weighing the outcomes. The decision is context specific and depends on the problem under study, the priorities and values of a given country and the feasibility of policy implementation including material, financial and human resources. It is suggested that policy makers to obtain feedbacks from experts before making the final judgment on the policy option.

	<p>d) Does PCT consider different services and aspects (epidemiological, clinical and economic) for interventions yes/no (Give details if applicable)</p> <p>e) Do services reflect the ethnic and socio-economic diversity of the PCT? yes/no (Give details if applicable)</p> <p>f) Compare services against the evidence. Do the services offered by PCT have evidence to show they are likely to be effective? yes/no (Give details if applicable)</p>
<p>5) Define the outcomes Scores: 0/12</p>	<p>a) Are the key outcome indicators for interventions defined? yes/no short term yes/no intermediate yes/no long-term yes/no</p> <p>b) Are the projected outcomes based on NICE guidelines? yes/no</p> <p>c) What interventions are implemented by PCT?</p> <p>d) Any other alternative interventions considered? yes/no (Give details if applicable)</p> <p>e) Is there evidence from the literature supporting the interventions/outcomes stated? yes/no (Give details if applicable)</p>
<p>6) Evaluation Scores: 0/4</p>	<p>What plans does the PCT have (if any) to evaluate obesity interventions? What time frames are specified? What methods will be used for evaluation? What are the total costs of the obesity strategy? Are the costs of the strategy and resources for evaluation clearly identified?</p>
<p>7) Make conclusions about the value of local policies Scores: 0/2</p>	<p>a) Could this PCT's policy be improved? If so, how?</p> <p>b) Are there PCTs that are examples of good practice?</p> <p>c) What could be done to improve the evaluation of local policies?</p>

Appendix 13: Analysis of obesity strategies for included PCTs

PCT/ IC-OSAF Criteria	Descriptions
Brent	
State problem Yes Scores: 2/4	National trends and prevalence of obesity (2); prevalence of obesity & health impact of obesity in PCT (2): Comments: The national trends and prevalence of obesity amongst children; and also PCT trends and prevalence for childhood obesity are given with consideration of the health impacts. Childhood obesity is used as a proxy for obesity. There are no national or PCT statistics for adult obesity given. The health impacts of childhood obesity are described as the resulting reduction in cancers, cardiovascular disease, stroke and type2 Diabetes. Score: 1
Defined Context Yes Scores: 2/2	Describe the profile of the PCT (background information and determinants of health problems including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators) (2): Comments: There is detailed information on the ethnicity, age structure, and rates of employment and deprivation scores with note being made of significant differences in mortality and morbidity between the south and north of the borough Score: 2
Identify local data & evidence used Yes Scores: 2/2	Does the PCT use information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data)? (2): Comments: Yes. The policy uses NICE guidelines (2006), National Heart Forum guidance, DCFS government report, GP data on BMI status and other studies Score: 2
Examine current strategies Yes Scores: 19/24	<p>a) What management strategies are available (based on NICE)? (4): Comments: Yes. There are few local strategies implemented (e.g. 'Brent Health', 'Well Being strategy' and health needs assessment). Training for school catering and teaching staff in healthy eating and obesity recognition as part of the 'Food in Schools' programme is stated. The well-being programmes implemented include 'MEND' programme to treat childhood obesity. The details on HIA are not reported Score: 3</p> <p>b) What services are available (based on NICE)? (4): Comments: There is limited information on the availability of primary care services, and not much mention of GPs except their involvement in recording BMI status. There is an emphasis on community care based approach using school nurses, dieticians and health visitors. The secondary and tertiary care is not discussed Score: 2</p> <p>Does PCT have local authorities and partners in the community services? (4): Comment: Yes. The early years setting has breastfeeding initiatives to lower childhood obesity and infant mortality rates. The 'MEND and Food in Schools programme' are implemented in local schools. Workplaces, self help and commercial programmes are not mentioned. Scores: 2</p> <p>Clinical/ Treatment Pathways for adult (2) & children (2): Comments: The clinical/treatment pathways of childhood obesity is tackled with measurement, assessment and lifestyle measures but no mention of adult treatment pathways Score: 2</p> <p>c) Does PCT have Non-NHS public programmes? (2): Comments: Yes. The non NHS public programmes are mentioned (e.g. '5 a day' initiative uses GIS mapping and works with retailers and the schools Score: 2</p> <p>d) Does PCT consider different services and aspects (epidemiological, clinical and economic) for interventions? (2): Comments: Yes. The epidemiological, clinical and economic aspects are considered (as evident in the local health needs assessment done) Score: 2</p> <p>e) Do services reflect the ethnic and socio-economic diversity of the PCT? (2): Comments: Yes. The ethnic and social diversity is reflected by services that target specific groups (e.g. reducing soft drink consumption in BME boys) Score: 2</p> <p>f) Compare services against the evidence. Do the services offered by PCT have evidence to show they are likely to be effective? (2): Comment: Yes. Services are evidence based, e.g. the 'MEND' programme and its references are cited.</p>

	Score: 2
Define Outcomes Yes Scores: 10/12	<p>a) Are the key outcome indicators for interventions defined? (4): Comments: The short term and medium term outcomes for 'MEND' programme are not defined but individual results (BMI, WC, diet and fitness levels) will be collated after three years. Score: 2</p> <p>b) Are the projected outcomes based on NICE guidelines? (2): Comments: The projected outcomes appear to be based on NICE guidance Score: 2</p> <p>c) What interventions are implemented by PCT? (2): Comments: Interventions implemented by the PCT include 'MEND' and 'FIS' programmes Score: 2</p> <p>d) Any other alternative interventions considered? (2) Comments: Alternative interventions such as the redirection of resources to primary care and community prevention are mentioned Score: 2</p> <p>e) Is there evidence from the literature supporting the interventions/ outcomes stated? (2) Comments: Yes. Evidence from literature used to support interventions, e.g. 'MEND' programme has a lot of details given and references cited Score: 2</p>
Evaluation Yes Scores: 2/4	<p>Does the PCT have any plan to evaluate obesity interventions? and states the details (4) Comments: Yes. Evaluation of MEND mentioned and details of the results to be collated. Score: 2</p>
Conclusions & value of local policy Yes Scores: 1/2	<p>Could policy be improved (2)? Comments: Yes. The policy can be further improved by clearly defining the problem and providing information on current services available at the PCT. The policy did not mention how adult obesity will be tackled and some included documents were not clear. There are no national or PCT statistics for adult obesity given. The details on HIA are not reported. The secondary and tertiary care is not discussed. Workplaces, self help and commercial programmes are not mentioned. There is no mentioned of adult treatment pathways. Score: 1</p>
Total scores	38/50
Hounslow	
State problem Yes Scores: 2/4	<p>National trends and prevalence of obesity (2); prevalence of obesity & health impact of obesity in PCT (2): Comments: The national prevalence and trends of obesity are described; whilst, the PCT prevalence is given for Year 6 and reception children. The projected rates for adulthood obesity are available based on a model. There is a recognition of the impact of obesity, CHD is named as the second biggest killer in Hounslow Score: 2</p>
Defined Context Yes Scores: 1/2	<p>Describe the profile of the PCT (background information and determinants of health problems including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators) (2): Comments: There is limited information given on the profile of the PCT particularly demographic (e.g. total population, gender proportions and etc.); whereas others are stated (socio-economic profile, ethnicity, health, morbidity & mortality indicators). There is socio economic information on obesity amongst children that is mapped against deprivation in the borough. There is no local ethnicity data given although the national data is provided (pg.11). The morbidity and mortality indicators are addressed by CHD admission and deaths. Score: 1</p>
Identify local data & evidence used Yes Scores: 2/2	<p>Does the PCT use information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data)? (2): Comments: Yes. NICE guidance, GP QOF data, national UK statistics (HSE), public health reports and national policy guidelines have all contributed to the policy. Score: 2</p>
Examine current strategies Yes	<p>a) What management strategies are available (based on NICE)? (4) Comments: Yes. There are few local strategies implemented based on NICE guidance. Training for frontline staff is mentioned. There are few well-being programmes currently in progress, but no</p>

<p>Scores: 14/24</p>	<p>details on specific training programme are stated in the action plan. HIA is not stated Score: 3 b) What services are available (based on NICE)? (4) Comments: Services available are based on NICE (and delivered by GPs, dieticians, public health nurses, school nurses and health visitors). The secondary care are delivered health professionals such as hospital midwives and endocrinologists and most often at the local hospital. There is no information stated on tertiary care. Score: 3 Does PCT have local authorities and partners in the community services? (4) Comments: Yes. The early years setting has breastfeeding initiatives carried out by postnatal staff and the 'FIS' programme at the preschool settings. Schools have the 'FIS' and 'NCMP' initiatives. For workplaces, the proposed initiatives include nutritional standards (e.g. in the NHS, MOD and the Prison service) and green transport schemes. The self-help programmes include use of personalized services to reduce weight, but no commercial programmes are mentioned. Score: 2 Clinical/ Treatment Pathways for adult (2) & children (2): Comments: There is limited information given on clinical/treatment pathways for adult and children. For children, the assessment and measurements are obtained through the 'NCMP' and other lifestyle programmes (such as 'FIS' and PA programmes). Other information are not stated (e.g. specialist referral, counselling, drug treatment are not mentioned and follow up) Score: 1 c) Does PCT have Non-NHS public programmes (2)? Comments: Yes. The non-NHS public programmes are mentioned (e.g. '5 a day' programme) for schools and retailers. There are only limited programmes offered. Score: 1 d) Does PCT consider different services and aspects (epidemiological, clinical and economic) for interventions? (2) Comments: Yes. Different services and their aspects are considered in choosing interventions. There is limited information stated. Scores: 1 e) Do services reflect the ethnic and socio-economic diversity of the PCT? (2) Comments: Yes. The ethnic and social diversity is considered for example there was an increased in sport participation for the >55s, BME groups and the disabled people. The policy only used national data on ethnicity and no local information is included. There is no information given related to services offered to different ethnic groups. Score: 1 f) Compare services against the evidence. Do the services offered by PCT have evidence to show they are likely to be effective? (2) Comment: Yes. Services are evidence based (e.g. the NICE guidance), but there is limited evidence showing the effectiveness of interventions Score: 1</p>
<p>Define Outcomes Yes Scores: 7/12</p>	<p>a) Are the key outcome indicators for interventions defined? (4) Comments: The short term and intermediate outcome indicators are not defined. There are mostly long-term outcome indicators (e.g. 5 hours of PA a week for children and target reductions in childhood obesity are stated). Score: 2 b) Are the projected outcomes based on NICE guidelines? (2) Comments: The projected outcomes are stated based on NICE guidance, but no details are included. Score: 1 c) What interventions are implemented by PCT? (2) Comments: There are wide range of interventions discussed. More details are needed on interventions implemented particularly for adults and various ethnic groups. Score: 1 d) Any other alternative interventions considered? (2) Comments: The alternative interventions considered include are the 'green transport' programme and 'cycle schemes'. Score: 2 e) Is there evidence from the literature supporting the interventions/ outcomes stated? (2) Comments: There is some evidence given (e.g. NICE guidance is mentioned though not much detail was discussed), but limited evidence from the literature is included to support interventions/outcomes. Score: 1</p>
<p>Evaluation</p>	<p>Does the PCT have any plan to evaluate obesity interventions? And states the details</p>

Yes Scores: 2/4	(4) Comments: There are plans to audit the 5 hours of PE a week initiative for children and use this to identify gaps and targets as appropriate. The statements for evaluation of interventions are stated but no details are given Score: 2
Conclusions & value of local policies Yes Scores: 1/2	Could policy be improved (2)? Comments: Yes. The policy can be improved adding specific strategies for evaluation. Score: 2 There are few well-being programmes currently in progress, but no details on specific training programme are stated in the action plan. HIA is not stated. There is no information stated on tertiary care. The self-help programmes include use of personalized services to reduce weight, but no commercial programmes are mentioned. There is limited information given on clinical/treatment pathways for adult and children. Other information is not stated (e.g. specialist referral, counselling, drug treatment are not mentioned and follow up). There are only limited non-NHS public programmes offered. There is limited information stated on the use of epidemiological, clinical and economic aspects for interventions. The policy only used national data on ethnicity and no local information is included. There is no information given related to services offered to different ethnic groups. There is limited evidence showing the effectiveness of interventions. More information is needed to assess if the projected outcomes are based on NICE guidelines. Interventions at PCT level for adults and ethnic groups need to be explained in more details. There is limited evidence from the literature included to support interventions/outcomes. The statements for evaluation of interventions are stated but no details are given (particularly one methods and timeline).
Total scores	29/50
Hillingdon	
State the problem Yes Scores: 2/4	National trends and prevalence of obesity (2); prevalence of obesity & health impact of obesity in PCT (2): Comments: The national obesity trend and projected prevalence for adults are stated, but there is no statistic reported at PCT level. The local obesity prevalence amongst children in Year 6 and reception children year are included. Health impact of obesity in PCT is not mentioned. Score: 2
Define the context Yes Scores: 1/2	Describe the profile of the PCT (background information and determinants of health problems including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators) (2): Comments: The breastfeeding rates (in percentages) and obese/overweight children (in percentages) are given, but there is limited information on ethnicity, age, morbidity or mortality data for the PCT. The national costs and impact are given though figures for the PCT are not stated. Score: 1
Identify local data & evidence used Yes Scores: 1/2	Does the PCT use information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data)? (2): Comments: The policy uses NICE guidance; UK national statistics (cited from BHF report & Foresight report); Public Health reports (e.g. Hillingdon PCT Annual Public Health Report 2005); and national policy guidelines (e.g. National Audit Office Report and Foresight Report etc.) but the GP data is not used. More evidence from literature is needed to support effectiveness of strategies. Score: 1
Examine current strategies Yes Scores: 14/24	a) What management strategies are available (based on NICE)? (4) Comments: Yes. There are few local strategies implemented (e.g. 'MEND' programme, 'Green spaces', 'walks and sports partnerships'). Training on healthy eating is provided for child-minders, parents and catering staff. The 'Well-being' programmes implemented include 'FIS' and 'breastfeeding initiatives'. HIA is not mentioned. The management strategies are mainly focusing on interventions for children. There is limited information on management strategies for adults. Score: 3 b) What services are available (based on NICE)? (4): Comments: There are few community services included (e.g. dieticians in 'FIS' programme; school nurses in 'NCMP'; and health visitors/ midwives in breastfeeding initiatives). The secondary care mentioned includes exercise referral scheme runs by the local cardiac unit. The primary or tertiary care services are not stated. Score: 2 Does PCT have local authorities and partners in the community services? (4): Comments: Yes. In the early years setting PCT has local partnership in the 'Sure-start scheme' and 'breastfeeding initiatives'. The 'MEND' and 'FIS' programmes are implemented in partnership with local schools. In workplace settings, there is agreement to

	<p>introduce 'healthy food' and 'cycle' schemes for council employees. Self help and commercial programmes are not mentioned. Score: 2 Clinical/ Treatment Pathways for adult (2) & children (2): Comments: The clinical/treatment pathways of children obesity are measurement and assessment through the 'NCMP' and lifestyle changes (within the 'FIS' and 'MEND' programmes), however the pathway does not include specialist referral, counselling and drug treatment. The adult pathways only focus on lifestyle (e.g. increasing PA and employer involvement) and there is limited information available. Score: 3 c) Does PCT have Non-NHS public programmes? (2) Comments: Yes. There is limited non NHS public programme included (e.g. the cycling training programmes) Score: 1 d) Does PCT consider different services and aspects (epidemiological, clinical and economic) for interventions? (2) Comments: Yes. There is consideration of epidemiological, clinical and economic aspects for intervention, but only limited information is given. Score: 2 e) Do services reflect the ethnic and socio-economic diversity of the PCT? (2) Comments: No. Socio economic and ethnic diversity are not discussed. More information is needed on socio-economic and ethnic diversity used to plan services in the PCT Score: 0 f) Compare services against the evidence. Do the services offered by PCT have evidence to show they are likely to be effective? (2) Comment: Yes. There is evidence for the services from the references given but not in any detail Score: 1</p>
<p>Define the outcomes Yes Scores: 9/12</p>	<p>a) Are the key outcome indicators for interventions defined? (4) Comments: The short term key outcome indicators for the MEND programme include BMI and heart rate; and the long-term indicator stated is 5 hours of physical education for 5-16 year olds after three years. The intermediate indicators are not discussed. There is limited information given on other programmes Score: 3 b) Are the projected outcomes based on NICE guidelines? (2) Comments: The outcomes are based on NICE guidelines though there is little detail provided Score: 1 c) What interventions are implemented by PCT? (2) Comments: Interventions implemented by the PCT include 'MEND' and 'FIS'. There are also 'breastfeeding' and 'play' initiatives. Score: 2 d) Any other alternative interventions considered? (2) Comments: Alternative interventions considered are the provision of quality food and physical education space into the Building Schools for the future programme as well as managing the spread of fast food outlets near schools. Score: 2 e) Is there evidence from the literature supporting the interventions/ outcomes stated? (2) Comments: Evidence from the literature includes references to Government reports and NICE guidance though not much detail is given. Score: 1</p>
<p>Evaluation Yes Scores: 2/4</p>	<p>Does the PCT have any plan to evaluate obesity interventions? and states the details (4) Comments: Evaluation of the 'MEND' programme is discussed but not in detail. Score: 2</p>
<p>Conclusions & value of local policy Yes Scores: 2/2</p>	<p>Could policy be improved (2)? Comments: Improvement can be made with more specific details of outcome and the use of local statistics such as GP data. Score: 2 There is a need to include statistics on past, current and projected level of obesity for both adults and children in the PCT to enable accurate description of issues. Information on health impact of obesity is not stated. A comprehensive profile of the PCT is required and may include information on ethnicity, age, morbidity or mortality data.. There is lack of evidence from local statistics (e.g. GP data) and literature to support effectiveness of strategies. There is limited information on management strategies for adults. The primary or tertiary care services are not stated. The PCT has not included self-help and commercial</p>

	programmes as strategies for local authorities partnership in the community. There is limited information available on clinical/treatment pathways and used of epidemiological, clinical and economic aspects for intervention. The key outcome indicators are not clearly stated, e.g. short, intermediate and long-terms. There is little evidence indicating that the outcomes are based on NICE guidelines. Evaluation strategies must be clearly indicated.
Total scores	31/50
Westminster	
State the problem Unclear Scores: 1/4	National trends and prevalence of obesity (2); prevalence of obesity & health impact of obesity in PCT (2): Comments: There are no statistics for national trends and prevalence of obesity for children and adult stated. The statistics for PCT prevalence of obesity for adults is not reported, and there are only figures for children aged 2 to 10 years. The health impacts of obesity in PCT are stated (e.g. T2 Diabetes, gallbladder disease, CHD, hypertension and cancers). Information needed on prevalence and trends of obesity at National and PCT level for adults and children must be stated. Score: 1
Define the context Yes Scores: 1/2	Describe the profile of the PCT (2); background information and determinants of health problems (including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators): Comments: Some background information and determinants of health problems for the PCT are provided (e.g. are ethnicity and risk of obesity, morbidity, cost of treating obesity). Other information is not given and need to be considered (such as demographic: total population, gender proportions etc; socio-economic profile; health; and mortality indicators) Score: 1
Identify local data & evidence used Yes Scores: 1/2	Does the PCT use information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data)? (2): Comments: Yes. The policy uses NICE guidance, GP local data and national policy guidelines (e.g. National Audit Office Report, Foresight Report). Sources of information not used are GP national data, UK National statistics and Public Health Reports. The policy needs more evidence from literature (publications) to support effectiveness of strategies. Score: 1
Examine current strategies Yes Scores: 13/24	a) What management strategies are available (based on NICE)? (4) Comments: The management strategies focus on developing policy on prevention and treatment of obesity amongst children and adults. Others are community (neighbourhood-level action) and healthy schools programme (e.g. healthy school meals, physical education). Well-being programmes were planned for children and adults (e.g. 'Programme for healthier Westminster', 'Childhood obesity treatment pathway group in 2006', and 'Children and Young People's Plan 2006-09'). There is an express needs for skilled local workforce (multidisciplinary human resources) in implementing programmes, but no clear statement on specific training needs stated. HIA was conducted in 2005. Score: 4 b) What services are available (based on NICE)? (4): Comments: The primary care services offered include health visitors (for 'breast feeding' and 'infant feeding' programmes); 'Sure-start' units and 'children's centres' (for young children); and nurse practitioners (offering weight advices to children and families). The community services offered are community dietetic counselling; 'Fit for life programme' (focusing on healthy eating and PA); 'Drop into weight' programme; and 'Health walks' programme. The secondary community services are stated, but no details given. The tertiary services are offered through 'auspices of LAA' for overweight/obese children and their family, however no other information is stated. Score: 2 Does PCT have local authorities and partners in the community services? (4): Comments: Yes. The early years settings focus on 'breastfeeding' and 'weaning' programmes (for young children and their mothers and deprived communities). There are no details given on specific programmes. PCT-school partnership support few programmes including the 'Healthy schools programmes'; 'The Westminster School sports Partnership' (development of physical education within the curriculum and outside of school hours); 'Westminster city council school travel plan advisors' (development of action plans to encourage active commuting by children); 'The Westminster school meals' (revision of service specification to ensure a nutritious school meal service); and 'National schools measuring programme' (surveillance of levels of overweight and obesity at PCT and individual schools level). There is no information given on self-help and commercial programmes. Score: 2 Clinical/ Treatment Pathways for adult (2) & children (2): Comments: Obesity treatment care pathway is to be implemented according to the 'Obesity prevention and treatment strategies 2006-09' particularly for children and young

	<p>people. There is no information given or indications for the implementation of adult clinical/treatment pathways. Score: 1 c) Does PCT have Non-NHS public programmes? (2) Comments: No. There is a need to include non-NHS public programmes if available or planned. Score: 0 d) Does PCT consider different services and aspects (epidemiological, clinical and economic) for interventions? (2) Comments: Yes. There are different services considered for interventions like epidemiological (e.g. obesity prevalence, healthy impacts of obesity), clinical (e.g. GP & secondary services) and economic (e.g. national direct costs of obesity, increasing cost of obesity drugs & lipid-lowering drugs, PCT operating cost in a year) are considered. Score: 2 e) Do services reflect the ethnic and socio-economic diversity of the PCT? (2) Comments: Yes. The services are targeted for children and adult particularly in the community and school settings. One of the main focus is on vulnerable groups at risk of obesity particularly people from different ethnics background (e.g. Indians, Black African & Black Caribbean) and people with disabilities (learning, physical and mental illness). There is limited information on social economic status. Score: 1 f) Compare services against the evidence. Do the services offered by PCT have evidence to show they are likely to be effective? (2) Comment: Yes. The prevention strategy using diet and PA are suggested in the policy and the services are based on Health reports and guidelines (e.g. 'Wanless Report 2004', 'Choosing Health: making healthier choices easier 2004'; 'Tackling health inequalities 2004'). The treatment strategies using clinical pathways proposed for children are based on NICE guidelines. The economic justifications for services are based on national and local health reports. There is no evidence from the literature included to support the effectiveness of services implemented. Score: 1</p>
<p>Define the outcomes Yes Scores: 6/12</p>	<p>a) Are the key outcome indicators for interventions defined? (4): Comments: There are only limited short-term outcome indicators stated (e.g. to halt the year on year rise in overweight and obesity levels for children), thus more indicators need to be formulated. There is no intermediate key outcome indicators stated. The majority of key outcome indicators are long-term (e.g. 'to implement an evidence-based multi-agency prevention and health promotion programmes for children and adults'; 'to implement an evidence-based obesity care pathway for children and adults based on the NICE guideline'). Score: 3 b) Are the projected outcomes based on NICE guidelines? (2) Comments: The outcomes for the proposed obesity treatment care pathway for children and adults are based on NICE guidelines, but more details are needed. Score: 1 c) What interventions are implemented by PCT? (2) Comments: The prevention interventions implemented include promoting healthy eating and PA for children and adults and people with disabilities (e.g. 'The programme for healthier Westminster'). The community interventions focus on young children and their mothers (e.g. 'breastfeeding' programme and 'Sure-starts units'); community dietetic services (e.g. 'Fit for life' programme and 'Drop in to weight'); neighbourhood-level action to promote healthy eating, access of affordable healthy food and PA (e.g. 'Food co-ops' and 'Minding the Gaps' programmes); and promoting healthy eating and PA in schools (e.g. 'The Healthy Schools Programme'). The treatment interventions are not clearly stated. Score: 1 d) Any other alternative interventions considered? (2) Comments: Alternative interventions considered are obesity treatment care pathway, prevention programmes for vulnerable groups at risk of obesity, neighbourhood-level action, skilled local workforce, surveillance and monitoring, evaluation, and communication strategies with public and local partners. There are no details given for the alternative interventions. Score: 1 e) Is there evidence from the literature supporting the interventions/ outcomes stated? (2) Comments: No. Evidence from the literature is not included. Score: 0</p>
<p>Evaluation Unclear</p>	<p>Does the PCT have any plan to evaluate obesity interventions? and states the details (4)</p>

Scores: 1/4	Comments: Unclear. There are no clear strategies indicated to evaluate the interventions. Obesity treatment needs assessment was done. Score: 1
Conclusions & value of local policy Yes Scores: 1/2	Could policy be improved (2)? Comments: Yes. In general, a clear problem statement and specifying key outcomes indicators for interventions can improve the policy. Score: 1 More information is needed on prevalence and trends of obesity at National and PCT level for adults and children. Other useful information not clearly stated are demographic (e.g. total population, gender proportions); socio-economic profile; health; and mortality indicators. There is lack of evidence from literature (publications) to support effectiveness of strategies. The management strategies have not stated specific trainings strategies to meet the express needs for skilled local workforce (for multidisciplinary human resources) in implementing the programmes. There is limited information stated on secondary (e.g. clinical/treatment pathways), community services and tertiary services. The policy has not mentioned self-help, commercial programmes and adult clinical/treatment pathways. The non-NHS public programmes and alternative intervention are not stated. There is lack of evidence from the literature to support the effectiveness of services implemented. The key outcome indicators are not clearly explained, e.g. the outcomes for the proposed obesity treatment care pathway for children and adults need to be clearly stated.
Total scores	26/50

Appendix 14: Validation Questionnaire for PCTS in NWL

Name:

Designation:

Please mark your response with 'X' and provide comments if applicable for each item

No	Item	Yes	No	Comments
1	Is each construct for IC-OSAF considered appropriate?			
	a. State the problem			
	b. Define the context			
	c. Identify local data and evidence used			
	d. Examine current strategies			
	e. Define the outcomes			
	f. Evaluation			
	g. Conclusion			
2	Is the information presented for each domain accurate?			
	a. Obesity trends, prevalence & health impacts: National and local level			
	b. Country profile			
	c. Use of local published data and evidence in policies			
	d. Current strategies			
	e. Non NHS public programmes			
	f. Key outcomes indicators for current strategies are defined			
	g. Evaluation plan			
3	Is the included data considered appropriate for England?			
4	Is the quality assessment scheme of IC-OSAF for each component appropriate?			
	a. categorical subjective measures (yes/unclear/no) represent depth and coverage of information of each domain of IC-OSAF			
	b. scoring system indicate policy quality for each PCT			
5	Is there any significant limitation for IC-OSAF as obesity strategies assessment tool at local level?			
6	Do you have any suggestions for improvement?			

Appendix 15: Summary of analysis results for PCTs in NWL

PCT/ Characteristics	Brent	Hounslow	Hillingdon	Westminster
Policy Context	<p>National trends and prevalence of obesity: Only for childhood obesity.</p> <p>Prevalence of obesity and health impact for PCT: Only for childhood obesity.</p> <p>The health impacts included are reduction in cancers, cardiovascular disease, stroke and type2 Diabetes</p> <p>PCT's Profile: Information on the ethnicity, age structure, and rates of employment and deprivation scores stated (including significant differences in mortality and morbidity between the south and north of the borough)</p>	<p>National trends and prevalence of obesity: reported for adults and children.</p> <p>Prevalence of obesity and health impact for PCT: Prevalence of obesity and health impact for PCT: given for children (year 6 and reception) and the projected rates for adulthood obesity are available based on a model.</p> <p>Cardiac heart diseases are stated as most significant impact of obesity</p> <p>PCT's Profile: Only some information is given (socio-economic profile, ethnicity, health, morbidity & mortality indicators). The socio economic information on obesity among children is mapped against deprivation in the borough. There is no local ethnicity information but the national data is provided. The morbidity and mortality indicators are addressed by CHD admission and deaths.</p>	<p>National trends and prevalence of obesity: Only projected prevalence for adults are stated.</p> <p>Prevalence of obesity and health impact for PCT: The local obesity prevalence amongst children in Year 6 and reception children year are included.</p> <p>The health impact of obesity in PCT is not mentioned.</p> <p>PCT's Profile: There is limited information given on ethnicity, age, morbidity or mortality data. The national costs and impact are given but figures for the PCT are not stated.</p>	<p>National trends and prevalence of obesity: Not stated for children and adults.</p> <p>Prevalence of obesity and health impact for PCT: There are only figures for children aged 2 to 10 years.</p> <p>The health impacts of obesity in stated are T2 Diabetes, gallbladder disease, CHD, hypertension and cancers.</p> <p>PCT's Profile: Some background information and determinants of health problems provided (e.g. are ethnicity and risk of obesity, morbidity, cost of treating obesity).</p>
Current strategies	<p>Management: Few local strategies are implemented (e.g. 'Brent Health', 'Well Being strategy' and health needs assessment). Training for school catering and teaching staff as part of the 'Food in Schools' programme is stated. The well-being programmes are implemented (e.g. 'MEND' programme for</p>	<p>Management: Few local strategies are implemented based on Training for frontline staff is mentioned. Few well-being programmes are currently in progress, but no details on specific training programme are stated in the action plan. HIA is not stated.</p> <p>Services available: Services available are based on NICE (and delivered by GPs, dieticians, public health</p>	<p>Management: Few local strategies are implemented (e.g. 'MEND' programme, 'Green spaces', 'walks and sports partnerships'). Training on healthy eating is provided for child-minders, parents and catering staff. The 'Well-being' programmes implemented include 'FIS' and 'breastfeeding initiatives'.</p>	<p>Management: Strategies focus on developing local policies.</p> <p>Services available: The primary care services offered include health visitors (for 'breast feeding' and 'infant feeding' and 'Sure-start' units and 'children's centres' (for young children); and nurse practitioners (offering weight</p>

PCT/ Characteristics	Brent	Hounslow	Hillingdon	Westminster
	<p>childhood obesity) The details on HIA are not reported</p> <p>Services available: There is limited information on the availability of primary care services, and not much mention of GPs except their involvement in recording BMI status. There is an emphasis on community care based approach using school nurses, dieticians and health visitors. The secondary and tertiary care is not discussed</p> <p>The early years setting has breastfeeding initiatives to lower childhood obesity and infant mortality rates. The 'MEND and Food in Schools programme' are implemented in local schools. Workplaces, self help and commercial programmes are not mentioned.</p> <p>Clinical/treatment pathways: The clinical/treatment pathways of childhood obesity is tackled with measurement, assessment and lifestyle measures but no mention of adult treatment pathways</p> <p>Non-NHS public programmes: The non NHS public programmes are mentioned (e.g. '5 a day' initiative</p>	<p>nurses, school nurses and health visitors). The secondary care are delivered health professionals such as hospital midwives and endocrinologists and most often at the local hospital. There is no information stated on tertiary care.</p> <p>Local authorities and partners: The early years setting has breastfeeding initiatives carried out by postnatal staff and the 'FIS' programme at the preschool settings. Schools have the 'FIS' and 'NCMP' initiatives. For workplaces, the proposed initiatives include nutritional standards (e.g. in the NHS, MOD and the Prison service) and green transport schemes. The self-help programmes include use of personalized services to reduce weight, but no commercial programmes are mentioned.</p> <p>Clinical/treatment pathways: There is limited information given on clinical/treatment pathways for adult and children. For children, the assessment and measurements are obtained through the 'NCMP' and other lifestyle programmes (such as 'FIS' and PA programmes). Other information are not stated (e.g. specialist referral, counselling, drug treatment are not mentioned and follow up)</p> <p>Non-NHS public programmes: The non-NHS public programmes are mentioned (e.g. '5 a day' programme) for</p>	<p>HIA is not mentioned. The management strategies are mainly focusing on interventions for children. There is limited information on management strategies for adults.</p> <p>Services available: There are few community services included (e.g. dieticians in 'FIS' programme; school nurses in 'NCMP'; and health visitors/midwives in breastfeeding initiatives). The secondary care mentioned includes exercise referral scheme runs by the local cardiac unit. The primary or tertiary care services are not stated.</p> <p>Local authorities and partners: In the early years setting PCT has local partnership in the 'Sure-start scheme' and 'breastfeeding initiatives'. The 'MEND' and 'FIS' programmes are implemented in partnership with local schools. In workplace settings, there is agreement to introduce 'healthy food' and 'cycle' schemes for council employees. Self help and commercial programmes are not mentioned.</p> <p>Clinical/treatment pathways: The clinical/treatment pathways of children obesity are measurement and</p>	<p>advice to children and families). The community services offered are community dietetic counselling; 'Fit for life programme' (focusing on healthy eating and PA); 'Drop into weight' programme; and 'Health walks' programme. The secondary community services are stated, but no details given. The tertiary services are offered for overweight/obese children and their family, however no other information is stated.</p> <p>Local authorities and partners: The early years settings focus on 'breastfeeding' and 'weaning' programmes (for young children and their mothers and deprived communities). There are no details given on specific programmes. PCT-school partnership support few programmes including the 'Healthy schools programmes'; 'The Westminster School sports Partnership' (development of physical education within the curriculum and outside of school hours); 'Westminster city council school travel plan advisors' (development of action plans to encourage active commuting by children); 'The Westminster school meals' (revision of</p>

PCT/ Characteristics	Brent	Hounslow	Hillingdon	Westminster
	<p>uses GIS mapping and works with retailers and the schools</p> <p>Other strategies use: The ethnic and social diversity is reflected by services that target specific groups (e.g. reducing soft drink consumption in 'BME' boys)</p>	<p>schools and retailers. There are only limited programmes offered.</p> <p>Other strategies use: Different services and their aspects are considered in choosing interventions. There is limited information stated.</p> <p>The ethnic and social diversity is considered for example there was an increased in sport participation for the >55s, BME groups and the disabled people. The policy only used national data on ethnicity and no local information is included. There is no information given related to services offered to different ethnic groups.</p>	<p>assessment through the 'NCMP' and lifestyle changes (within the 'FIS' and 'MEND' programmes), however the pathway does not include specialist referral, counselling and drug treatment. The adult pathways only focus on lifestyle (e.g. increasing PA and employer involvement) and there is limited information available.</p> <p>Non-NHS public programmes: There is limited non NHS public programme included (e.g. the cycling training programmes)</p> <p>Other strategies use: There is consideration of epidemiological, clinical and economic aspects for intervention, but only limited information is given.</p> <p>Socio economic and ethnic diversity are not discussed.</p>	<p>service specification to ensure a nutritious school meal service); and 'National schools measuring programme' (surveillance of levels of overweight and obesity at PCT and individual schools level). There is no information given on self-help and commercial programmes.</p> <p>Clinical/treatment pathways: To be implemented according to the 'Obesity prevention and treatment strategies 2006-09' particularly for children and young people. There is no information given or indications for the implementation of adult clinical/treatment pathways.</p> <p>Non-NHS public programmes: none</p> <p>Other strategies use: There are different services considered for interventions like epidemiological (e.g. obesity prevalence, healthy impacts of obesity), clinical (e.g. GP & secondary services) and economic (e.g. national direct costs of obesity, increasing cost of obesity drugs & lipid-lowering drugs, PCT operating cost in a year) are considered</p> <p>The services are also targeted at children and adult</p>

PCT/ Characteristics	Brent	Hounslow	Hillingdon	Westminster
				from vulnerable groups at risk of obesity particularly people from different ethnic backgrounds (e.g. Indians, Black African & Black Caribbean) and people with disabilities (learning, physical and mental illness). There is limited information on social economic status.
Use of Evidence	<p>The policy uses NICE guidelines (2006), National Heart Forum guidance, DCFS government report, GP data on BMI status and other studies</p> <p>Evidence from literature used to support interventions, particularly for 'MEND' programme (details given and references cited)</p>	<p>NICE guidance, GP QOF data, national UK statistics (HSE), public health reports and national policy guidelines have all contributed to the policy.</p> <p>Limited evidence from the literature is included to support interventions/outcomes.</p>	<p>The policy uses NICE guidance; UK national statistics (cited from BHF report & Foresight report); Public Health reports (e.g. Hillingdon PCT Annual Public Health Report 2005); and national policy guidelines (e.g. National Audit Office Report and Foresight Report etc.) but the GP data is not used. More evidence from literature is needed to support effectiveness of strategies.</p> <p>Evidence from the literature includes references to Government reports and NICE guidance though not much detail is given.</p>	<p>The policy uses NICE guidance, GP local data and national policy guidelines (e.g. National Audit Office Report, Foresight Report). Sources of information not used are GP national data, UK National statistics and Public Health Reports.</p> <p>. Evidence from the literature is not included.</p>
Policy outcomes	<p>Key outcome indicators: The short term and medium term outcomes for 'MEND' programme are not defined but individual results (BMI, WC, diet and fitness levels) will be collated after three years.</p> <p>Projected</p>	<p>Key outcome indicators: The short term and intermediate outcome indicators are not defined. There are mostly long-term outcome indicators (e.g. 5 hours of PA a week for children and target reductions in childhood obesity are stated).</p> <p>Projected outcomes: The projected outcomes are stated based on NICE guidance, but no</p>	<p>Key outcome indicators: The short term key outcome indicators for the MEND programme include BMI and heart rate; and the long-term indicator stated is 5 hours of physical education for 5-16 year olds after three years. The intermediate indicators are not discussed. There is</p>	<p>Key outcome indicators: There are only limited short-term outcome indicators stated (e.g. to halt the year on year rise in overweight and obesity levels for children). There is no intermediate key outcome indicators stated. The majority of key outcome indicators are long-term (e.g. 'to</p>

PCT/ Characteristics	Brent	Hounslow	Hillingdon	Westminster
	<p>outcomes: The projected outcomes appear to be based on NICE guidance</p> <p>Interventions implemented at PCT: 'MEND' and 'FIS' programmes</p> <p>Alternative interventions: The redirection of resources to primary care and community prevention are mentioned</p>	<p>details are included.</p> <p>Interventions implemented at PCT: There is wide range of interventions discussed. More details are needed on interventions implemented particularly for adults and various ethnic groups.</p> <p>Alternative interventions: The 'green transport' programme and 'cycle schemes'.</p>	<p>limited information given on other programmes</p> <p>Projected outcomes: The outcomes are based on NICE guidelines though there is little detail provided</p> <p>Interventions implemented at PCT: Interventions implemented by the PCT include 'MEND' and 'FIS'. There are also 'breastfeeding' and 'play' initiatives.</p> <p>Alternative interventions: The provision of quality food and physical education space into the Building Schools for the future programme as well as managing the spread of fast food outlets near schools.</p>	<p>implement an evidence-based multi-agency prevention and health promotion programmes for children and adults'; 'to implement an evidence-based obesity care pathway for children and adults).</p> <p>Projected outcomes: The outcomes for the proposed obesity treatment care pathway for children and adults are based on NICE guidelines, but more details are needed.</p> <p>Interventions implemented at PCT: Prevention - focus on children, adults and people with disabilities (e.g. 'The programme for healthier Westminster'). The community interventions focus on young children and their mothers (e.g. 'breastfeeding' programme and 'Surestarts units'); community dietetic services (e.g. 'Fit for life' programme and 'Drop in to weight'); neighbourhood-level action to promote healthy eating, access of affordable healthy food and PA (e.g. 'Food co-ops' and 'Minding the Gaps' programmes); and promoting healthy eating and PA in schools (e.g. 'The Healthy Schools Programme'). The treatment interventions are</p>

PCT/ Characteristics	Brent	Hounslow	Hillingdon	Westminster
				<p>not clearly stated.</p> <p>Alternative interventions: Obesity treatment care pathway, prevention programmes for vulnerable groups at risk of obesity, neighbourhood-level action, skilled local workforce, surveillance and monitoring, evaluation, and communication strategies with public and local partners. There are no details given for the alternative interventions.</p>
Evaluation	Evaluation of MEND mentioned, details of results to be collated.	There are plans to audit the 5 hours of PE a week initiative for children and use this to identify gaps and targets as appropriate. The statements for evaluation of interventions are stated but no details are given	Evaluation of the 'MEND' programme is discussed but not in detail.	There are no evaluation strategies indicated

Appendix 16: Quality assessment summary of obesity strategies for PCTs in NWL

PCT/	Brent	Hounslow	Hillingdon	Westminster
ICOSAF Criteria & scores				
State problem (4)	Yes (2)	Yes (2)	Yes (2)	Unclear (1)
Defined Context (2)	Yes (2)	Yes (1)	Yes (1)	Yes (1)
Identify local data & evidence used (2)	Yes (2)	Yes (2)	Yes (1)	Yes (1)
Examine current strategies (24)	Yes (19)	Yes (14)	Yes (14)	Yes (13)
Define Outcomes (12)	Yes (10)	Yes (7)	Yes (9)	Yes (6)
Evaluation (4)	Yes (2)	Yes (2)	Yes (2)	Unclear (1)
Conclusions & value of local policy (2)	Yes (1)	Yes (2)	Yes (2)	Yes (1)
Total scores (50)	38	29	31	26
Quality	High	Adequate	Adequate	Adequate
<i>Footnotes</i>				
Yes: most information is stated; Unclear: unable to make judgment due to lack of information stated; No: no information is stated; PCT: primary care trust; High: total scores 35 to 50; Adequate: total scores 26 to 34; Poor: total scores 0-25; Quality: a review's judgments on the completeness of information reported using the characteristics of ICOSAF and the three main categories are 'high' , 'adequate' and 'poor' .				

Appendix 17: Summary of recommendations for included PCTs

PCT/ ICOSAF	Brent	Hounslow	Hillingdon	Westminster
Policy Context	<p>Define the problem & context:</p> <ul style="list-style-type: none"> Provide national and PCT statistics on adulthood obesity (e.g. trends and prevalence) Explain the health impacts of obesity for adults based on available statistics at national and PCT level 	<p>Define the problem & context:</p> <ul style="list-style-type: none"> Provide PCT's statistics on adulthood obesity (e.g. trends and prevalence) Give a comprehensive profile of PCT (e.g. demographic, socio-economic and health indicators) 	<p>Define the problem & context:</p> <ul style="list-style-type: none"> Provide PCT's statistics on obesity among adult and children (e.g. trends and prevalence) Explain the health impacts of obesity for children and adults using available statistics at national and PCT level Give a comprehensive profile of the PCT (e.g. demography, socio-economic, ethnicity, health, morbidity & mortality indicators) 	<p>Define the problem & context:</p> <ul style="list-style-type: none"> Provide national and PCT's statistics on adulthood and childhood obesity (e.g. trends and prevalence) Give other information on PCT's profile (e.g. total population, gender proportions, socio-economic profile, health, and mortality indicators)
Current strategies	<p>Management strategies:</p> <ul style="list-style-type: none"> To incorporate data on HIA done and formulate the interventions based on the findings. <p>Services available (based on NICE):</p> <ul style="list-style-type: none"> To consider other services e.g. secondary and tertiary care in planning and implementing interventions To establish services with other local authorities and partners in the community including workplaces, self help and commercial programmes To include adult clinical/treatment pathways 	<p>Management strategies:</p> <ul style="list-style-type: none"> To state the specific training needs for the existing and future programmes To outline the well-being programmes implemented To conduct HIA and generate interventions based on the results. <p>Services available (based on NICE):</p> <ul style="list-style-type: none"> To consider tertiary care for interventions To establish services with other local authorities and partners in the community, i.e. self-help and commercial programmes To clearly explain the clinical/treatment pathways use for adult and children (particularly on services like specialist referral, counseling, drug treatment and 	<p>Management strategies:</p> <ul style="list-style-type: none"> To state information on local obesity strategies developed and implemented, specific training needs, well-being programmes available and HIA. <p>Services available (based on NICE):</p> <ul style="list-style-type: none"> To consider other services e.g. primary and tertiary care in planning and implementing interventions To establish services with other local authorities and partners in the community, i.e. self-help and commercial programmes To clearly explain the clinical/treatment pathways implemented for adult and children 	<p>Management strategies:</p> <ul style="list-style-type: none"> To identify and state the specific trainings needs for skilled local workforce (using a multidisciplinary approach) in implementing the programmes. <p>Services available (based on NICE):</p> <ul style="list-style-type: none"> To consider other services e.g. community, secondary care and tertiary care. To establish services with other local authorities and partners in the community, i.e. self-help and commercial programmes To clearly explain the clinical/treatment pathways implemented for adult and children <p>Non-NHS public programmes:</p> <ul style="list-style-type: none"> To state the

PCT/ ICOSAF	Brent	Hounslow	Hillingdon	Westminster
		<p>follow up</p> <p>Non-NHS public programmes:</p> <ul style="list-style-type: none"> To consider promoting the programmes <p>Other strategies use:</p> <ul style="list-style-type: none"> To apply epidemiological, clinical and economic aspects for interventions To consider ethnicity and socio-economic factors at PCT level when formulating interventions 	<p>Other strategies use:</p> <ul style="list-style-type: none"> To state use of epidemiological, clinical and economic aspects for intervention To consider ethnicity and socio-economic diversity in PCT when planning the services 	<p>available programmes</p>
Use of Evidence	<ul style="list-style-type: none"> To include more evidence from the literature to support interventions for other programmes implemented 	<ul style="list-style-type: none"> To use evidence from the literature to support the effectiveness of interventions and outcomes 	<ul style="list-style-type: none"> To use evidence from local statistics (e.g. GP data) and literature to support effectiveness of strategies. 	<ul style="list-style-type: none"> To use evidence from the literature to support effectiveness of strategies.
Policy outcomes	<ul style="list-style-type: none"> To formulate specific short and medium key outcomes indicators (well defined, measureable and have time frames) 	<ul style="list-style-type: none"> To formulate specific short term and intermediate key outcomes indicators (well defined, measureable and have time frames) To state the projected outcomes (based on NICE guidelines) 	<ul style="list-style-type: none"> To formulate specific short, intermediate and long-term key outcomes indicators (with time frames) To state the projected outcomes (based on NICE guidelines) for both adults and children 	<ul style="list-style-type: none"> To formulate specific short term and intermediate key outcomes indicators (well defined, measureable and have time frames) To state the projected outcomes (based on NICE guidelines)
Evaluation	<ul style="list-style-type: none"> To specify evaluation strategies, process and timeline. 	<ul style="list-style-type: none"> To specify evaluation strategies, process and timeline 	<ul style="list-style-type: none"> To specify evaluation strategies, process and timeline 	<ul style="list-style-type: none"> To specify evaluation strategies, process and timeline.

Appendix 18: Summary of government's health expenditure from 2007 to 2010

Cost	2007/08	2008/09	2009/10
THB (B\$ Millions)	259.72	264.44	286.82
THE (B\$ Millions)	294.82	322.13	311.85
HB as % of National Budget	6.96	7.08	7.29
HE as % of Government Expenditure	7.38	8.41	NA
Per Capita HB(B\$)	666.00	664.00	706.00
Per Capita HE (B\$)	756.00	809.00	768.00
<i>Footnotes</i>			
THB: Total Health Budget; THE: Total Health Expenditure; HB: Health Budget; HE: Health Expenditure; B\$: Brunei National Dollars; % Percentage			

Appendix 19: The strategy map for Brunei's obesity prevention and management strategies

Phase	Primary	Secondary/Tertiary
Proposed Plan	Aged 18 yrs & above, BMI 25-30, no co-morbidities (chronic diseases)	
Phase 1	<i>HEALTH EDUCATION PROGRAMMES (KBS)</i>	
	<ul style="list-style-type: none"> • 6 weeks programme • Assessment: baseline parameters & fitness • Interventions: HE on diet & PA & Counselling support. • Team: Health Educators, a Dietician & a Psychologist • Plan: <ol style="list-style-type: none"> 1) KBS staffs need training in performing fitness assessment 2) New positions needed are Physiotherapists & PA trainers 	
	<i>KBS (HPC)</i>	
	<ul style="list-style-type: none"> • Improve existing programme • To establish Stress test facilities (including ECG & Bio-impedance machine) 	
Phase 2	Aged 18 yrs & above, BMI > 30 with co-morbidity (DM & Hypertension)	
	<ul style="list-style-type: none"> • Require drugs & bariatric treatment • Need referral • Establish <i>Referral Protocol</i> 	<ul style="list-style-type: none"> • OBESITY CLINIC (RIPAS)
		→
		<ul style="list-style-type: none"> • CARDIAC REHABILITATION (RIPAS)
Phase 2	Children and Adolescent (aged <18 yrs), overweight	
	<i>CHILDREN & ADOLESCENT (SCHOOL HEALTH PROGRAMMES)</i>	
	<ul style="list-style-type: none"> • Huge demands from schools for services • Plan: <ol style="list-style-type: none"> 1) To invite experts to plan SH programmes 2) To organize visits to the SH Promotion Centres in the region 3) To review School Health Protocol 4) To hold meeting with stakeholders (SHS, Paediatricians & MOE) 5) To reinforce existing relevant health promotion policies (including obtaining yearly report from MOE) 6) To conduct pilot study on dietary programme targeting pre-school children 7) To conduct HE Trainings for teachers 	
Phase 3	Expansion of HPC	
	<i>OBESITY NATIONAL CENTRE</i>	
	<ul style="list-style-type: none"> • To establish steering committee & task-force • To organize series of stakeholders' meetings • Expansion of HPC venue and services • Requires more facilities and staffs' trainings 	

Appendix 20: Obesity prevention and management services in Brunei

Primary	Secondary/Tertiary
<p><i>KBS (HPC)</i></p> <ul style="list-style-type: none"> • 6 weeks programme • Interventions: PA (PA), HE, dietary & counselling support. • Team: GPs, a Dietician, a Psychologist, Nurses, Health Educators & a PA Trainer. • Recruitment criteria: aged >18 yrs, BMI >30 & no medical history of chronic diseases 	<p><i>OBESITY CLINIC (RIPAS)</i></p> <ul style="list-style-type: none"> • 6 months (3 stages) programme • Interventions: metabolic and fitness assessment, PA, dietary, health education & psychological support. • Others: drug therapy & bariatric Surgery • Team: an Endocrinologist, Dieticians, a Psychologist, Nurses & a Bariatric Surgeon • Recruitment criteria: Patient aged >18 yrs & BMI >30
<p><i>OVERWEIGHT CLINIC (SCHOOL HEALTH SERVICES & HPC)</i></p> <ul style="list-style-type: none"> • 1 year programme (3 visits and 4 monthly follow up) • Interventions: Medical screening, Dietary, PA & Counselling support (parental involvement) • Team: a Community Medical Officer, School Health Nurses & a Dietician. • Recruitment criteria: overweight students from Primary 1 & 4 	<p><i>CARDIAC REHABILITATION (RIPAS)</i></p> <ul style="list-style-type: none"> • 8 weeks programme • Interventions: assessment, dietary, PA, risk factor management, Counselling, psychosocial support & smoking cessation. • Team: a Cardiac Rehab. Coordinator, a Clinical Psychologist, Medical Officers, Dieticians, Diabetic Nurse Educators, Nurses, an Occupational Therapist, Pharmacists, a Physiotherapist (& Religious teacher. • Recruitment criteria: patients with MI, PTCA, CABG & Heart Failure

Appendix 21: The Characteristics of Brunei-ICOSAF

STEP	CHARACTERISTICS
1) State the problem	National trends and prevalence of obesity; prevalence of obesity & health impact of obesity in each district
2) Define the context	Does the profile of the country considered when defining the problem (background information and determinants of health problems including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators)? and states the details. YES/UNCLEAR/NO
3) Identify local data & evidence used (then examine where necessary)	<p>Does the MOH uses information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data)? YES/UNCLEAR/NO</p> <ul style="list-style-type: none"> • Nutritional guidelines YES/UNCLEAR/NO • Local data YES/UNCLEAR/NO • National Statistics YES/UNCLEAR/NO • Health Report YES/UNCLEAR/NO • National policy guidelines YES/UNCLEAR/NO
4) Examine current strategies	<p>a) What Management strategies are available/implemented by MOH? Please circle your answer for each item</p> <ul style="list-style-type: none"> • develop/implement local obesity strategies YES / UNCLEAR/NO • specific training YES / UNCLEAR/NO • develop/implement well-being programmes YES / UNCLEAR/NO • conduct health impact assessments YES / UNCLEAR/NO <hr/> <p>b) What services are available/implemented by MOH? Please circle your answer for each item and states details</p> <ul style="list-style-type: none"> • primary care YES / UNCLEAR/NO • community care YES / UNCLEAR/NO • secondary care YES / UNCLEAR/NO • tertiary care YES / UNCLEAR/NO <p>Does MOH have local authorities and partners in the community services? and states details. YES/UNCLEAR/NO</p> <ul style="list-style-type: none"> • early years settings YES / UNCLEAR/NO • schools YES / UNCLEAR/NO • workplaces YES / UNCLEAR/NO • self-help programme YES / UNCLEAR/NO • commercial programme YES / UNCLEAR/NO <p><u>Clinical/ Treatment Pathways (Please circle your answer for each item.)</u></p> <p>Children:</p> <p>Assessment YES / UNCLEAR/NO</p> <p>Measurements YES / UNCLEAR/NO</p> <p>Referral to specialist YES / UNCLEAR/NO</p> <p>Counselling YES / UNCLEAR/NO</p> <p>Lifestyle Behavioural/ Diet/ PA/ Family</p> <p>Drug treatment (not for children younger than 12 years, except under specialist paediatric settings) YES / UNCLEAR/NO</p> <p>Follow up YES / UNCLEAR/NO</p> <p>Adult:</p> <p>Assessment YES / UNCLEAR/NO</p> <p>Measurement YES / UNCLEAR/NO</p> <p>Referral to specialist YES / UNCLEAR/NO</p> <p>Counselling YES / UNCLEAR/NO</p> <p>Lifestyle Behavioural/ Diet/ PA/ Family</p> <p>Drug treatment YES / UNCLEAR/NO</p> <p>Follow up YES / UNCLEAR/NO</p> <hr/> <p>c) Does the country have Non-MOH public programmes? YES/UNCLEAR/NO (Please gives details if applicable)</p>

STEP	CHARACTERISTICS
	<p>d) Does MOH consider different services and aspects (epidemiological, clinical and economic) for interventions? YES/UNCLEAR/NO (Please give details if applicable)</p> <hr/> <p>e) Do services reflect the ethnic and socio-economic diversity of the country? YES/UNCLEAR/NO (Please give details if applicable)</p> <hr/> <p>f) Compare services against the evidence. Do the services offered by MOH have evidence to show they are likely to be effective? and states details YES/UNCLEAR/NO</p>
5) Define the outcomes	<p>a) Are the key outcome indicators for interventions/strategies defined? and states details. YES/UNCLEAR/NO short term YES / UNCLEAR/NO intermediate YES / UNCLEAR/NO long-term YES / UNCLEAR/NO</p> <p>b) Are the projected outcomes based on existing National Health Policy? and states details. YES/UNCLEAR/NO</p> <p>c) What interventions are implemented by MOH? (Please give details if applicable)</p> <hr/> <p>d) Any other alternative interventions considered? YES/UNCLEAR/NO (Please give details if applicable)</p> <hr/> <p>e) Is there evidence from the literature supporting the interventions/outcomes stated? and states details YES/UNCLEAR/NO</p>
6) Evaluation	<p>Does the MOH have any plan to evaluate obesity interventions? and states details YES/UNCLEAR/NO</p>
7) Make conclusions about the value of local policy	<p>Could MOH's existing strategies be improved? YES/UNCLEAR/NO If so, how?</p>

Appendix 22: Analysis of obesity strategies for Brunei

STEP	CHARACTERISTICS
1) State the problem	<p>National trends and prevalence of obesity and health impact; prevalence of obesity & health impact of obesity in each district</p> <p>Comments: The national statistic for adulthood obesity is reported in '1st Brunei National Health and Nutritional Status Survey (NHNSS)1997 Report' and the 'IHSHPCS 2007-2009'. The NHNSS is showing considerably high obesity prevalence among men (11.2%) and women (12.8%), and in total there is 45% of men and 44.1% of women are either overweight or obese; while the IHSHPCS has stated 64.4% of participants were either overweight or obese). The national statistics for childhood obesity is based on data from Maternal Child Health (MCH) clinic and Schools Health Programme (SHP). For children under the age of 5 years (who attended the MC clinic), there is relatively high prevalence of children who are overweight (57.2%) compared to those with normal weight (36%) in 2005; and similarly in 2009 (48.9% vs. 42%). The SHP data is showing slightly decreased in prevalence of overweight (14.7%) and obesity (1.8%) among children in specific school years (1,4,6 & 8) for 2005; and to 2009 (1.8% overweight vs. 12.4% obese). The health impacts related to obesity among adults are indicated by top five causes of mortality in the country in 2003 to 2007 as stated in the 'HPB 2011-2015' policy. There is no obesity statistics (e.g. trends and prevalence) and its health impact among children and adults are not reported at district level.</p>
2) Define the context	<p>Does the profile of the country considered when defining the problem (background information and determinants of health problems including demography, socio-economic profile, ethnicity, health, morbidity & mortality indicators)? and states the details.</p> <p>Comments: Yes. Information on health indicators, health impacts, modifiable risk factors, morbidity and mortality indicators are reported in many MOH's health reports and policies. Selected health indicators for the country from 2005 to 2008 are reported (e.g. crude birth rate, total fertility rate, crude death rate, infant mortality rate, under 5 mortality rate, maternal mortality ratio, life expectancy at birth) as stated in the 'HPB 2011-2015' policy. The top five causes of mortality (e.g. heart diseases and diabetes) in 2003 to 2007 for the country are related to obesity, based on 'Health Report 2007' and the 'HPB 2011-2015' policy. The common modifiable risk factors for NCDs recognized for the country are obesity, physical inactivity, unhealthy diet and tobacco and smoking, but there are limited statistics available in particular for physical inactivity and unhealthy diet for national and district level. In IHSPCS data, more than half of the civil servants were overweight (female 63.2%, male 65.4%) or obese (female 54.1%, male 65.4%); and the participants have one or more modifiable risk factors for NCDs (high blood cholesterol, high blood sugar and high blood pressure) as shown in the 'HPB 2011-2015' policy. The '2001 Population Census' showed there were 40,819 (15.1%) people are considered ever-smokers and the biggest group of smokers are adults (26,1888 people) in the age group of 20-39 years. There is limited data considered when defining the problem, while other information is not accounted at national level (e.g. demographic, socio-economic profile and ethnicity); and the information at district level is not available (particularly for 'Temburong', 'Belait' and 'Tutong' districts).</p>
3) Identify local data & evidence used (then examine where necessary)	<p>Does the MOH uses information from local/national published data and evidence from literature (publications, policy documents, unpublished reports & survey data)?</p> <p>Comments: Yes. MOH uses nutritional guidelines, national statistics and national policy guidelines (e.g. National Health Care Plan 2000-2010, the 'HPB 2011-2015' policy and 'The Ministry of Health Vision 2035 and Health Strategy'). Other information is not clearly stated (health report and district level data sets).</p>
4) Examine current strategies	<p>a) What management strategies are available/implemented by MOH? Please circle your answer for each item</p> <p>Comments: There are few local strategies implemented (e.g. 'Healthy Lifestyle Clinic', 'Integrated Civil Servants Health Screening' and 'Obesity Clinic' programmes), however other management strategies are not available (e.g. developing and implementing more local obesity strategies such as policies/guidelines (e.g. 'Healthy Public Policy', 'Healthy Workplace Policy', 'National Food Standards', 'Healthy Living Strategy for Local Community' & Healthy Living Blueprint for Schools), specific training, well-being programme and HIA)</p> <p>b) What services are available/implemented by MOH? Please circle your answer</p>

STEP	CHARACTERISTICS
	<p>for each item and states details</p> <p>Comments: The primary care services implemented through the ‘Healthy Lifestyle Clinic’ and ‘Smoking Cessation’ programmes. The services offered in the ‘Healthy Lifestyle Clinic’ programme include PA (PA), HE, dietary & Counselling Support. The team includes GP, dietician, psychologist, nurses, health educator & PA trainer. The community care services are implemented through ‘Overweight Clinic’, ‘Youth Outreach’ and ‘Healthy Village’ (‘Mukim Sihat’) programmes. The ‘Overweight Clinic’ is a school health programme and the interventions offered include medical screening, dietary, PA & counselling support (with parental involvement). The team includes a medical doctor, school health nurses and dietician. The secondary and tertiary care services are available through the ‘Obesity Clinic’ programme implemented at RIPAS Hospital, but the services may not be available in major hospitals in other districts. The secondary services offered includes metabolic and fitness assessment, PA, dietary, health education, drug treatment, bariatric surgery & psychological support by a team of health professionals (endocrinologist, dieticians, psychologist, nurses & bariatric surgeon). The tertiary care services are implemented through ‘Cardiac Rehabilitation’ programme that includes assessment, dietary, PA, risk factor management, counselling & psychosocial support. The team implementing the services includes cardiac rehab coordinator, clinical psychologist, medical doctor, dietician, diabetic nurse educator, nurses, occupational therapist, pharmacist, physiotherapist, smoking cessation doctor & religious teacher (please refer to ‘Obesity prevention and management services’ table in ‘Appendix 6’). The programme is implemented in Brunei-muara and Kuala belait districts.</p> <p>Does MOH have local authorities and partners in the community services? and states details.</p> <p>Comments: Yes. The early years setting has breastfeeding initiative that is carried out at the MCH clinic in each district. The main aim of the programme is to lower childhood obesity and infant mortality rates. The ‘Overweight Clinic’ and ‘HPSs’ programmes are implemented in partnership with local schools, but the implementation of strategies relevant to obesity prevention and management are minimal. The ‘Health Village’ (‘Mukim Sihat’) and ‘Youth Outreach’ programmes are community services offered by HPC. The ‘Health Village’ (‘Mukim Sihat’) programme offers healthy lifestyle activities implemented in partnership with the local communities in each village at the district level. The ‘Integrated Civil Servants Health Screening’ programme is the only community service programme implemented in partnership with workplaces. There is no information on self-help and commercial programmes.</p> <p>States the clinical/ treatment pathways planned and implemented for adults (2) & children (2):</p> <p>Comments: There is no indication that clinical/treatment pathways are available for adults and children.</p>
	<p>c) Does the country have Non-MOH public programmes? YES/UNCLEAR/NO (Please gives details if applicable).</p> <p>Comments: No. There is non-MOH public programme.</p>
	<p>d) Does MOH consider different services and aspects (epidemiological, clinical and economic) for interventions? (Please give details if applicable)</p> <p>Comments: Yes. There is consideration of epidemiological (e.g. national prevalence of obesity), clinical (health impacts of obesity e.g. diabetes and CHD) and economic (e.g. national health care costs) aspects for intervention, but only limited information is available.</p>
	<p>e) Do services reflect the ethnic and socio-economic diversity of the country? (Please give details if applicable)</p> <p>Comments: Yes. The ethnic and socio-economic diversity at national and districts level are not clearly reflected by services.</p>
	<p>f) Compare services against the evidence. Do the services offered by MOH have evidence to show they are likely to be effective? and states details</p> <p>Comments: Yes. The services implemented are based on health reports and guidelines (e.g. the ‘NHSS 1997’ report, the ‘National Health Care Plan 2000-2010’, the ‘Vision 2035 Ministry of Health Strategy’ policy, the ‘HPB 2011-2015’ policy & the ‘National PA Guidelines for Brunei Darussalam’), but there is limited evidence from the literature included to support the effectiveness of services implemented.</p>
5) Define the	a) Are the key outcome indicators for interventions/strategies defined? and states

STEP	CHARACTERISTICS
outcomes	<p>details.</p> <p>Comments: Yes. There are 4 strategic objectives relevant to obesity formulated in the 'HPB 2011-2015' policy. Each objective has several initiatives with time frames given and the leading agencies stated. The objectives are: (1) 'Establish and strengthen health in all policies (HiAP)'; (2) 'Develop effective, quality and innovative health promotion programmes to promote healthy diet, PA and reduce tobacco use'; (3) 'Enhance intersectoral collaboration and partnership to promote healthy settings and networking'; (4) 'Develop health promotion skills and competencies'.</p> <p>The initiatives for objective '1' are: review the 'National Committee on Health Promotion' (2011-12, short-term); review current policies on healthy living (2011-2, short term); formulate health-related policies in all ministries (2011-5, long-term); and review feasibility of legislation to healthy living (2014, long-term).</p> <p>The initiatives for objective '2' in reducing obesity are: develop obesity action plan with stakeholders, review weight management programme in MOH and in partnership with private sector and establish adolescent weight management programme (2011-3, intermediate). The initiatives for promoting healthy diet are: review 'National Dietary Guidelines' (NDG) and develop Brunei recommended dietary allowance (RDA) (2011-2, short-term); review the 'National Infant & Young Child Feeding' programme (2011, short-term), facilitate reduction of consumption of salt, sugar and fat in the population (2011-2, intermediate); develop food standard (2011-3, intermediate), and enforce nutrition labelling (2011-3, intermediate). The initiatives for promoting PA are: develop evidence-based 'National PA Guidelines' (NPAG) with relevant stakeholders (2011, short-term); and facilitate the implementation of 'NPAG' (2011-3, intermediate). The initiatives to reduce tobacco use are: review the 'Tobacco control programme' (2011, short-term); develop action plan on education communication aspect of the programme (2011-2, intermediate); and conduct 'Global Youth Tobacco Survey' (GYTS) (2012, intermediate).</p> <p>The initiatives for objective '3' to promote 'healthy settings' are: advocate for 'Healthy Cities' approach to be used in 'BSB Masterplan' & 'Urban Planning' (2011-2, intermediate); develop 'healthy workplace programme' for civil service (2011-5); enhance community participation through the 'Mukim Consultative Councils' programme (2011-5, long-term); evaluate and strengthen 'HPS (HPS) initiative (2013, intermediate); establish 'Healthy Lifestyle Clubs' in all secondary schools and organize 'National Convention of Healthy Lifestyle Clubs' (2011-4, intermediate); and conduct final phase of current 'IHSHPCS' (2011, short-term). The initiatives to promote 'networking' are: enhance collaboration & partnerships on 'healthy lifestyle programmes' with NGOs, community groups & private sectors (2011-5, long-term); enhance collaboration & partnership on 'healthy lifestyle' programmes with media & IT institutions (2011-5, intermediate); develop collaborative programmes on Research & Training related to health promotion with institutions of higher learnings (2011-5, intermediate); and develop and collaborate with hawkers, restaurants, supermarkets & grocery stores on 'Healthy Food Choice' programme (2011-3, intermediate).</p> <p>The initiatives for objective '4' to develop health promotion skills & competencies are: strengthening HPC infrastructure & resources (2012-5, intermediate); develop generic guidelines for proposal of any 'health promotion programme' (2011, short-term); develop competencies & professional standards for nurses, HEO & Allied health professionals in health promotion (2011-3, intermediate); review & update primary school science & extra curricular activity curriculum on health lifestyle topics (2011-3, intermediate); develop prepackaged weight management programmes for other agencies & groups (2011-2, intermediate); and develop STI prevention programme training for school counselors & teachers (2011-3, intermediate).</p> <p>The goals of the strategic objectives, indicators and outcomes are indicated. The first goal is 'establishment and strengthening of HiAP of Government'. The main indicator for the goal is 'total number of ministries with health-related policies'; and the main outcome is '5% increments in the number of Ministries with health related policies per year' (short-term).</p> <p>The second goal is 'strengthening community and public/private sector collaboration and partnership'. The main indicator is 'total number of collaboration and partnerships'; and the main outcome is '5% increase in the number of collaboration and partnerships with other agencies in strengthening HP programme implementation by</p>

STEP	CHARACTERISTICS
	<p>2015 (long-term).</p> <p>The third goal is ‘Prevention and Control of NCDs’. The main indicator is ‘percentage reduction of premature NCD-related mortality’; and the main outcome 5% reduction of premature NCD-related mortality by 2015 (long-term).</p> <p>The short term, intermediate and long-term outcome indicators are defined based on ‘HPB 2011-15’ policy. There are mostly short-term and intermediate outcome indicators. However, the methods and activities of the initiatives in achieving the objectives are not specified, and therefore the initiatives might not be achievable in the projected time frames.</p> <p>b) Are the projected outcomes based on existing National Health Policy? and states details Comments: Yes. The projected outcomes are considered defined based on the ‘HPB 2011-5’ policy.</p> <p>c) What interventions are implemented by MOH? (Please give details if applicable) Comments: Interventions implemented by the MOH include the ‘healthy lifestyle clinic’ and ‘smoking cessation’ programmes (primary care); ‘Overweight clinic’ programme implemented by school health services, ‘Youth Outreach Programme’ and ‘Healthy Mukims’ programmes are implemented by HPC (community care); ‘Obesity clinics’ programme implemented at RIPAS Hospital (secondary care); and ‘Cardiac rehabilitation’ programme implemented at the Hospitals in Brunei-muara and Kuala belait districts (tertiary care). Others are the ‘HPS’ programme (a partnership with schools); ‘Integrated civil servant screening programme (implemented in collaboration with workplaces); and ‘breastfeeding’ programme (offered at maternal child health clinics and hospitals).</p> <p>d) Any other alternative interventions considered? (Please give details if applicable) Comments: No. The alternative interventions are not stated.</p> <p>e) Is there evidence from the literature supporting the interventions/outcomes stated? and states details Comments: No. There is limited information given that the interventions/outcomes are supported by evidence from the literature.</p>
6) Evaluation	<p>Does the MOH have any plan to evaluate obesity interventions? and states details Comments: No. There are no details given on the evaluation methods for existing ‘Healthy Lifestyle’ policies and programmes indicated in the ‘HPB 2011-15’ policy and other MOH’s documents.</p>
7) Make conclusions about the value of local policies	<p>Could MOH’s existing strategies be improved? Comments: Yes. The national trends and prevalence of obesity for childhood obesity (particularly for under age of 5 years and over as well as children at all school years) must be stated. At district level, the prevalence of obesity among children and adults is necessary. It is important to differentiate between prevalence of obesity in adults and children, as the interventions for them will differ. There is a need to provide information on health impacts at district level, for example, type 2 diabetes, stroke and CHD can all arise as a consequence of obesity and could be included and then compared to national averages. A comprehensive profile of the country must be considered (e.g. demographic, socio-economic and ethnicity), and the information at district level is not available (particularly for ‘Temburong’, ‘Belait’ and ‘Tutong’ districts) when defining the problem. To incorporate health reports and data sets at district level in planning and implementing the interventions and use evidence from literature to support effectiveness of interventions. The management strategies to consider are developing and implementing more local obesity strategies related to policies/guidelines (e.g. ‘Healthy Public Policy’, ‘Healthy Workplace Policy’, ‘National Food Standards’, ‘Healthy Living Strategy for Local Community’ & Healthy Living Blueprint for Schools), specific trainings, well-being programmes and HIAs. There is limited information on the availability of community care services implemented at district and national level. The community initiatives programmes to consider are: improving access to healthy foods at affordable prices; healthy eating activities including cookery clubs for families; and physical exercise strategies for different age groups and population groups (e.g. older people, people with disability,</p>

STEP	CHARACTERISTICS
	<p>children and family) including establishing community PA schemes and centres as well as improving walking routes and public transport schemes. These initiatives can be incorporated into the existing programmes such as the ‘Healthy Village’ (‘Mukim Sihat’) and ‘Youth Outreach’ programmes at national and district levels. There is no evidence that the primary, secondary and tertiary services are implemented in other districts (e.g. Tutong and Temburong districts). MOH needs to consider implementing clinical/treatment pathways for adults and children in the management of obesity particularly in the primary care settings. The pathways for children are assessment, measurements, referral to specialist, counselling, lifestyle (behavioural, diet, PA and family), drug treatment (not for children younger than 12 years, except under specialist paediatric settings) and follow up. The pathways for adults include assessment, measurements, referral to specialist, counselling, lifestyle (behavioural, diet, PA and family), drug treatment and follow up. There is a need to report non-MOH public programmes if available or planned; and implement more activities that promotes collaboration with local authorities and partners (particularly at district level).</p> <p>Childhood obesity is currently a concern as indicated in the ‘HPB 2011-15’ policy, MOH must consider implementing school health activities or programmes at national and district levels in partnership with local schools, community and private sectors. The strategies may include: ‘Healthy Living Blueprint for Schools’; ‘School Healthy Meals Strategy’ policy and programmes; and Schools Programme – curriculum based HE for healthy choices, healthy eating & physical activities. The proposed strategies can be integrated into the existing programmes, such ‘HPS’ and ‘Overweight clinic’.</p> <p>Although, there are several initiatives formulated to promote ‘networking’ within the ‘HPB 2011-5’ policy, but the priorities, methods and activities are not stated. The policy needs to consider different services for interventions such as epidemiological (e.g. obesity trends and prevalence, health impacts of obesity) particularly for childhood obesity, clinical (e.g. GP & secondary services) and economic (e.g. national direct costs of obesity, increasing cost of obesity drugs & lipid-lowering drugs, MOH operating cost in a year) at national and district level. The short term, intermediate and long-term outcome indicators are defined based on ‘HPB 2011-15’ policy. There are mostly short-term and intermediate outcome indicators. However, the methods and activities of the initiatives in achieving the ‘strategic objectives’ are not specified, and therefore the initiatives might not be achievable in the projected time frames. There are no details given on the evaluation methods for existing ‘Healthy Lifestyle’ policies and programmes indicated in the ‘HPB 2011-15’ policy and other MOH’s documents.</p>

Appendix 23: Validation questionnaire of Brunei's obesity prevention and management strategies

Name:

Designation:

Please mark your response with 'X' and provide comments if applicable for each item

No	Item	Yes	No	Comments
1	Is each construct for Brunei-IC-OSAF considered appropriate? a. State the problem b. Define the context c. Identify local data and evidence used d. Examine current strategies e. Define the outcomes f. Evaluation g. Conclusion			
2	Is the information presented for each domain accurate? a. Obesity trends, prevalence & health impacts: National and district level b. Country profile c. Use of local published data and evidence in policies d. Current strategies e. Non MOH public programmes f. Key outcomes indicators for current strategies are defined g. Evaluation plan			
3	Is the quality assessment showed clarity and adequate coverage of information of each domain of IC-OSAF?			
4	Is the included data appropriate for Brunei?			
5	Is there any significant limitation for Brunei-IC-OSAF as assessment tool?			
6	Do you have any suggestions for improvement?			