

# Preventing Obesity: the effectiveness of a whole system approach



**PENINSULA**  
— MEDICAL SCHOOL —  
UNIVERSITIES OF EXETER & PLYMOUTH



## Preventing obesity using a 'Whole System Approach'

### Review 2:

### Preventing obesity:

## The effectiveness of Whole System Approaches

Revised Final Report: 11<sup>th</sup> January 2011

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# Preventing Obesity: the effectiveness of a whole system approach

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## About the Peninsula Technology Assessment Group (PenTAG)

The Peninsula Technology Assessment Group is part of the Institute of Health Service Research at the Peninsula Medical School. PenTAG was established in 2000 and carries out independent Health Technology Assessments for the UK HTA Programme, systematic reviews and economic analyses for NICE (Technology Appraisal and Centre for Public Health Excellence) and systematic reviews as part of the Cochrane Collaboration Heart Group, as well as for other local and national decision-makers. The group is multi-disciplinary and draws on individuals' backgrounds in public health, health services research, computing and decision analysis, systematic reviewing, statistics and health economics. The Peninsula Medical School is a school within the Universities of Plymouth and Exeter. The Institute of Health Research is made up of discrete but methodologically related research groups, among which Health Technology Assessment is a strong and recurring theme. Recent projects include:

- Preventing unintentional injuries in children: Systematic review to provide an overview of published economic evaluations of relevant legislation, regulations, standards, and/or their enforcement and promotion by mass media (2009)
- Preventing unintentional injury in children: Strategic and regulatory frameworks for guiding, enforcing or promoting activities to prevent unintentional injury in children and young people in the home environment (2009)
- Preventing unintentional injuries among under-15s in the home: systematic review of effectiveness and cost-effectiveness of home safety equipment and risk assessment schemes (2009)
- Interventions to prevent unintentional injury in children on the road: Systematic reviews of effectiveness and cost-effectiveness of road and street design-based interventions aimed at reducing unintentional injuries in children (2009)
- A systematic review of risk factors for unintentional injuries among children and young people aged under 15 years: Quantitative correlates review of unintentional injury in children (2009)
- Providing public information to prevent skin cancer. Barriers to and facilitators to conveying information to prevent first occurrence of skin cancer: a systematic review of qualitative research (2009)

## Acknowledgements

With many thanks to Jenny Lowe, Sue Whiffin and Stephany Leach for administrative support.

Many thanks also to the CPHE team (Adrienne Cullum, Caroline Mulvihill, Alastair Fischer, Andrew Hoy and Jane Huntley) for providing constructive feedback that facilitated the development and revision of this review.

## Declaration of authors' competing interests

No authors have competing interests.

# Preventing Obesity: the effectiveness of a whole system approach

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## List of abbreviations

ANGELO	Analysis Grid for Elements Linked to Obesity
APPLE	A Pilot Programme for Lifestyle and Exercise
ASSIA	Applied Social Sciences Index and Abstracts
BAEW	'Be Active, Eat Well' programme (Australia)
BMI	Body Mass Index
BMI-z	Body Mass Index z-scores
BoQ	Borough of Queenscliffe
BS	'Breathing Space' programme (UK)
CAS	Complex Adaptive System
CATI	Computer Assisted Telephone Interviews
CB	Capacity building
CDC	Centres for Disease Control and Prevention
CE	Community Engagement
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CoGG	City of Greater Geelong
Com	Communication
COMMIT	Community Intervention Trial for Smoking Cessation (USA/Canada)
CPHE	Centre for Public Health Excellence (National Institute for Health and Clinical Excellence)
DEFRA	Department for Environment, Food and Rural Affairs (UK)
DoH	Department of Health
EAP	Embeddedness of action for obesity prevention
EEN	Epoque European Network
EPAQ	Eating and Physical Activity Questionnaire
EPODE	'Ensemble, Prévenons L'Obésité Des Enfants' programme (France)
FL	Facilitative leadership
FLVS	Fleurbaix-Laventie Ville Santé
HLCK	'Healthy Living, Cambridge Kids' programme (USA)
HMIC	Health Management Information Consortium database

## Preventing Obesity: the effectiveness of a whole system approach

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INTUTE	Gateway to subject catalogues for study and research
KA&S	Key ages and stages
LC	Local creativity
MCH	Maternal and Child Health
MEDLINE	National Library of Medicine's bibliographic database
NHS	National Health Service
NSW	New South Wales
OPIC	Obesity Prevention in Pacific Communities
PDG	Programme Development Group
PenTAG	Peninsula Technology Assessment Group
PH	Public Health
PSFPI	Public Sector Food Procurement Initiative
R&C	'Romp & Chomp' programme (Australia)
R&S	Robustness and sustainability
Rel	Relationships
SES	Socioeconomic status
SHYC	'Steps to a Healthier Yuma County' programme (USA)
SuS	'Shape Up, Somerville' programme (USA)
Sys	System
WHHA	Wester Hailes Health Agency
WHO	World Health Organisation
WHURP	Wester Hailes Urban Regeneration Partnership
WSA	Whole System Approach

# Preventing Obesity: the effectiveness of a whole system approach

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## Glossary of terms

Bottom-up	Where activity in a system or organisation is initiated from grassroots rather than imposed from senior levels.
Complexity theory	A theoretical construct where a critical network of components self-organize to create structures with the potential to evolve and demonstrate emergent system properties
Conducive conditions	A set of circumstances which facilitate or impede a whole system approach
Kish grid	A tool for randomly selecting individuals in a household, using the address number and number of people of aged over 16 in the household to randomly select the individual for interview
Lay members	Members of the public who are not professional specialists in a subject area
Levels	Operating context, e.g. individual, neighbourhood, community, town, city, regional, or national.
Mandated partnerships	Imposed partnership formed through necessity; not voluntary in nature
Multi faceted	Having many aspects
Multi level	Operating on a number of levels
Organisation	An organised body of people with a particular purpose, e.g. a business
Positive evaluation	The ways in which members of an organisation regard each other
Settings	Patterns of behaviour restricted within time and space, either location-bound (e.g. schools) or activity-bound (e.g. sports activities)
Social ecological/socio-ecological model	A conceptual framework, based in sociological theory, designed to examine multiple effects and relationships within an environment at multiple levels from the individual to the societal

# Preventing Obesity: the effectiveness of a whole system approach

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## 1.1.1. Table of contents

List of abbreviations.....	3
Glossary of terms .....	5
1.1.1. Table of contents .....	6
1.1.2. List of figures .....	8
1.1.3. List of boxes.....	8
2. SUMMARY.....	9
2.1. Introduction.....	9
2.2. Aim .....	10
2.3. Methods .....	10
2.4. Results .....	12
3. BACKGROUND .....	22
3.1.1. Definition of whole system approaches .....	25
3.1.2. Some preliminary considerations for this systematic review .....	27
3.1.3. Following the problem/outcomes or following the mechanisms of change? .....	30
3.2. Rationale for including smoking prevention/cessation programmes .....	30
4. AIMS .....	31
4.1. Review questions .....	31
5. METHODS .....	32
5.1. Identification of evidence.....	32
5.1.1. Search strategy.....	32
5.1.2. Search processes and methods .....	32
5.1.3. Inclusion and exclusion criteria.....	34
5.2. Screening to identify relevant studies.....	35
5.2.1. Process of assessing presence of WSA features .....	37
5.2.2. Other judgements made during the iterative screening process .....	38
5.2.3. Summary of the searches conducted.....	39
5.3. Methods of analysis/synthesis .....	43
5.3.1. Data extraction & quality assessment .....	43
5.3.2. Data synthesis .....	44
6. RESULTS.....	49
6.1. Identified reports .....	49
6.1.1. Abstract/title screening .....	49
6.1.2. Full text screening .....	49
6.1.3. Excluded programmes exhibiting less than four WSA features .....	50
6.1.4. Included reports.....	50
6.1.5. Reinstated obesity prevention programmes.....	51
6.2. Overview of included programme characteristics.....	51
6.3. Overview of programme characteristics .....	54
6.3.1. Obesity prevention .....	54
6.3.2. Smoking prevention .....	64
6.4. Overview of study designs.....	68
6.4.1. Obesity prevention .....	68
6.4.2. Smoking prevention .....	73
6.4.3. Study quality .....	75
6.5. Study results - obesity .....	77
6.5.1. Anthropometric measures.....	77
6.5.2. Intermediate measures .....	86

# Preventing Obesity: the effectiveness of a whole system approach

---

6.5.3. Process measures .....	91
6.6. Study results – smoking cessation .....	95
6.6.1. Smoking outcomes.....	95
6.6.2. Intermediate outcomes.....	101
6.6.3. Process outcomes .....	103
7. DISCUSSION.....	114
7.1. Summary of main findings.....	114
7.2. Potential barriers and facilitators to implementation .....	116
7.3. Review strengths and limitations .....	117
7.3.1. Strengths and limitations of review methods .....	119
7.3.2. Strengths and limitations of included studies .....	121
References.....	124

# Preventing Obesity: the effectiveness of a whole system approach

---

## 1.1.2. List of figures

Figure 1: Review flowchart – Obesity prevention searches .....	41
Figure 2: Review flowchart – Smoking cessation searches .....	42
Figure 3 Structure of the COMMIT intervention .....	65
Figure 4. Structure of the Breathing Space intervention .....	67
Figure 5. Quit rates for COMMIT programme sites and comparison areas from 1983-88 and 1988-01 .....	99
Figure 6. Differences in the changes in smoking prevalence by COMMIT Intervention-comparison site pairs, 1988-93, those aged 25-64 .....	100
Figure 7. Quit attempt during past year, by area and study wave .....	101

## List of tables

Table 1. Categories under which information was extracted from included sources .....	43
Table 2. 'Core features' programme overview – obesity prevention programmes .....	46
Table 3 'Core features' programme overview – smoking cessation programmes .....	47
Table 4. Overview of WSA features exhibited by programme and study results .....	52
Table 5. Programme outcome data collection points .....	56
Table 6 Smoking cessation – overview of smoking and intermediate outcomes featured .....	74
Table 7. Intervention effectiveness data quality assessment summary - obesity prevention .....	76
Table 8. Intervention effectiveness data quality assessment summary – smoking prevention/cessation .....	76
Table 9. Overview of WSA features exhibited by programme and study results .....	97
Table 10. Diversity of core features within programmes .....	111

## List of boxes

Box 1. Features of a whole system approach to tackling public health problems .....	26
Box 2. Summary of each obesity prevention programme's study design .....	70
Box 3. Summary of each smoking prevention programme's study design .....	75



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## 2. Summary

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### 2.1. Introduction

The starting point for this systematic review is the working definition of whole system approaches to tackling public health problems, which was the product of Review 1 and PDG 1. This multi-dimensional definition asserts that a whole system approach comprises nine core features of systems working – capacity building, encouragement of local creativity, developing working relationships, community engagement, enhancing communication, embeddedness of policy and action, robustness and sustainability, facilitative leadership, and monitoring and evaluation – plus, the other key feature, that the design and development of the community-wide programme explicitly recognises the causes of the problem as a system.

In public health, there is a belief that for complex socially, environmentally and behaviourally caused problems like obesity that are created and sustained at multiple levels, it is not only *what you do* that can have desired impacts (i.e. not just the specific bundle of different activities and policy changes) but also *the way that you do it*, in terms of how organisations and communities aim to develop and implement activities and policy changes. This all creates novel challenges for a systematic review of effectiveness studies. There are precedents of effectiveness reviews of broad public health approaches (such as community engagement) but these still struggle to separate the relative importance of the principles and processes of achieving community-wide changes, and the specific actions and policies implemented in any given case.

At the very least, it requires reviews of such approaches to comprehensively describe both the types of specific prevention activities and policies that were delivered/introduced and also how the overall programme was conceived, developed and evolved (including the presence or absence of features of ‘systems working’). However, given any discovered variations in effectiveness between studies and programmes, this will multiply the challenges of attributing such variations to either the different component prevention strategies, the different ways they were developed and delivered, or a combination of both.

## **2.2. Aim**

This systematic review aimed to systematically identify, summarise, and synthesise relevant evaluation studies in order to answer the following two review questions.

### **Review questions**

Q1. How do the effectiveness, implementation and sustainability of whole system or whole community approaches to preventing obesity appear to vary in relation to:

- The specific combination of local actions and local strategies used to try and bring about change
- The characteristics of the population and/or places targeted (including level of social disadvantage)
- The local and national policy context
- Other factors which influence the effectiveness, implementation and sustainability of the relevant actions and strategies

Q2. How do the effectiveness, implementation and sustainability of whole system approaches to preventing smoking appear to vary in relation to the same factors listed for Q1.

## **2.3. Methods**

This systematic review was primarily based on bibliographic searches for comparative evaluations of obesity prevention programmes and smoking prevention programmes. These were supplemented by searches of the grey literature, internet searches, contacting authors, contacting experts and other contacts.

Study selection against predefined inclusion and exclusion criteria was conducted by two reviewers in three stages. (i) screening titles and abstracts; (ii) screening full-text papers and reports against all inclusion and exclusion criteria except the extent to which community-wide prevention programmes exhibited the core features of a Whole System Approach (WSA); (iii) assessing and mapping the presence of WSA features in potentially includable studies of community-wide multi-level prevention programmes.

## Preventing Obesity: the effectiveness of a whole system approach

---

Initially, included studies were selected on the criteria of exhibiting four or more features of systems working. This involved the late exclusion of three studies – one of EPODE ('Together, let's prevent childhood obesity'), one of its precursor programme Fleurbaix-Laventie Ville Santé (FLVS), based within two towns in France, and one programme titled A Pilot Programme for Lifestyle and Exercise (APPLE), based in New Zealand. However, it was judged that this exclusion criterion excessively limited the range and spread of whole system features within the obesity prevention programmes. On advice from the PDG, these excluded obesity prevention programmes were reinstated as included programmes, resulting in a total of eight included obesity prevention programmes.

As programmes targeting obesity prevention were the primary focus of this review, it was not judged to be necessary to reinstate those smoking cessation/ prevention programmes previously excluded on the basis of exhibiting four or less features of systems working.

Generic features of a whole system approach to obesity prevention were developed as part of a process through the series of reviews investigating a whole system approach to preventing obesity, including this current review looking at the effectiveness of a whole system approach. There were originally nine generic features which grew to ten features in the course of the programme of reviews and deliberations at the programme development meetings. The nine original features are shown in Box 1 (on p26). These features were used to identify the extent of whole system working within the originally-included (five obesity prevention and two smoking cessation/prevention) programmes. However, when the additional three obesity prevention programmes (EPODE, FLVS and APPLE) were subsequently included, all programmes were reassessed against the generic features of a whole system approach using the final list of ten features as shown in Box 2 (p.27).

A comprehensive range of study and programme details were extracted for each programme into a standard form. Each study was also quality-assessed using the standard multi-item checklist for quantitative comparative studies recommended by NICE methods. Through this process each study was given an overall rating for internal validity and external validity.

## Preventing Obesity: the effectiveness of a whole system approach

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Synthesis was achieved primarily through narrative means, although tables and graphs were used for those outcomes which were more comparable; or in some cases, conversely, to illustrate the wide variation in outcomes and results. Meta-analysis (the statistical pooling of study results) was not possible. Finally, findings are combined and summarised in Evidence Statements as recommended by NICE public health methods.

### 2.4. Results

Overall the obesity prevention bibliographic searches generated 2,429 unique references, and other sources generated a further 95 references for screening. This led to the provisional inclusion of 28 papers/reports covering the evaluation of eight community-wide programmes.

The smoking prevention bibliographic searches generated 3,577 unique references, and other sources generated a further 2 references for screening. This led to the provisional inclusion of 26 papers/reports covering the evaluation of ten community-wide programmes.

## Preventing Obesity: the effectiveness of a whole system approach

<p><b>Evidence statement 1: overview of evidence</b></p> <p>Of the 8 community-wide obesity prevention programmes included in this review (two BA: [-] USA (Drummond et al. 2009); [+] USA (Chomitz et al. 2010), three nRCT: [+] USA (Economos et al. 2007b); [+] Australia (Bell et al. 2008; Sanigorski et al. 2008); [+] New Zealand (4 sources*<sup>1</sup>), one cBA [+] Australia (12 sources *<sup>2</sup>), one longitudinal epidemiological study ([+] France (5 sources *<sup>3</sup>) and one repeated cross-sectional survey ([+] France: 3 sources *<sup>4</sup>), there were no studies of programmes in the UK, and all community-wide obesity prevention programmes targeted children below 14 years old. Of the 2 studies of community-wide smoking prevention programmes included in this review (one RCT [++] USA &amp; Canada: Platt et al. 2003, one cBA [+] UK: 9 sources*<sup>5</sup>) one study was of a community-wide prevention programme in Scotland.</p>
<p><b>Obesity prevention anthropometric outcomes</b></p> <p>There was a wide variety of outcomes reported across the 8 programmes (two BA [-] USA [+] USA, three nRCT [+] USA [+] Australia [+] New Zealand, one cBA [+] Australia, one longitudinal epidemiological study ([+] France) and one repeated cross-sectional survey ([+] France). Anthropometric outcomes reported were BMI and BMI-z scores, prevalence of children rated as overweight/obese, waist circumference and body weight.</p>
<p><b>Obesity prevention intermediate outcomes</b></p> <p>A diverse range of intermediate outcomes were reported in 4 studies (1 cBA study [+], 2 BA studies [-][+], and 1 nRCT [+], so were grouped by nutritional outcomes, physical activity outcomes and other outcomes.</p>
<p><b>Obesity prevention process outcomes</b></p> <p>One programme (cBA [+] set in Australia) reported process outcomes consisting of measures of parental awareness of the intervention, policies adopted or continued, and activities adopted or continued.</p>
<p><b>Smoking cessation/prevention cessation outcomes</b></p> <p>Two programmes reported smoking cessation data (including quit rate by individual, quit rate by smoker cohort, quit attempts in the past year) consisting of one controlled Before &amp; After (cBA) study (Breathing Space, UK [+]) and one randomised controlled trial (RCT) (COMMIT, USA/Canada [++]).</p>
<p><b>Evidence and range of whole system core features within obesity prevention programmes</b></p>

## Preventing Obesity: the effectiveness of a whole system approach

All 8 obesity prevention programmes included in the review (two BA [-] USA [+] USA, three nRCT [+] USA [+] Australia [+] New Zealand, one cBA [+] Australia, one longitudinal epidemiological study ([+] France) and one repeated cross-sectional survey ([+] France), demonstrated some evidence of local creativity. Seven programmes demonstrated inconsistent evidence of capacity building, robustness & sustainability and community engagement, but these features did not appear across the same 7 programmes. Five obesity prevention programmes demonstrated inconsistent evidence of a focus on the embeddedness of actions and policies, and of developing working relationships within and between partners. Four programmes demonstrated inconsistent evidence of a focus on enhancing communication between actors and organisations within the system, facilitative leadership and the use of well-articulated methods for monitoring and evaluation of activities.

\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

\*<sup>5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

### ***Evidence statement 2: Paucity of evidence from the UK***

Of the 8 programmes (two BA: [-] USA (Drummond et al. 2009); [+] USA (Chomitz et al. 2010), three nRCT: [+] USA (Economos et al. 2007b); [+] Australia (Bell et al. 2008; Sanigorski et al. 2008); [+] New Zealand (4 sources\*<sup>1</sup>), one cBA [+] Australia (12 sources \*<sup>2</sup>), one longitudinal epidemiological study ([+] France (5 sources \*<sup>3</sup>) and one repeated cross-sectional survey ([+] France: 3 sources \*<sup>4</sup>), of community-wide obesity prevention programmes identified for inclusion within this review, there were no studies of programmes in the UK. Of the 10 studies (one RCT [++] USA & Canada: Platt et al. 2003, one cBA [+] UK: 9 sources\*<sup>5</sup>, eight excluded) of community-wide smoking prevention programmes considered for this review, one study was of a community-wide prevention programme in Scotland.

\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

## Preventing Obesity: the effectiveness of a whole system approach

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

\*<sup>5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

### ***Evidence statement 3: Included obesity prevention interventions only focused on children***

All included obesity prevention programmes (two BA: [-] USA (Drummond et al. 2009); [+] USA (Chomitz et al. 2010), three nRCT: [+] USA (Economos et al. 2007b); [+] Australia (Bell et al. 2008; Sanigorski et al. 2008); [+] New Zealand (4 sources\*<sup>1</sup>), one cBA [+] Australia (12 sources \*<sup>2</sup>), one longitudinal epidemiological study ([+] France (5 sources \*<sup>3</sup>) and one repeated cross-sectional survey ([+] France: 3 sources \*<sup>4</sup>), targeted children below 15 years old.

Two programmes were directed towards lower age groups between 0-5 years in the Greater Geelong area, Victoria (cBA [+] Australia: 12 sources \*<sup>2</sup>) and one programme targeted kindergarten-age children attending child care centres in Yuma County, Arizona (BA [-] USA: Drummond et al. 2009). Mid to higher age groups were targeted in 5 programmes: one programme aimed at children aged between 4 and 12 years old attending school and preschool in Colac, Victoria (nRCT [+] Australia: Bell et al. 2008; Sanigorski et al. 2008), one programme aimed at children aged between 5 and 14 years old attending school and preschool in Cambridge, Massachusetts (BA [+] USA: Chomitz et al. 2010), one programme aimed at children aged between 4 and 12 years old attending school and preschool in one of 8 pilot towns in France (longitudinal epidemiological study [+] France: 5 sources \*<sup>3</sup>), one programme aimed at children aged between 5 and 12 years old attending school and preschool in Fleurbaix or Laventie in France (repeated cross-sectional survey [+] France: 3 sources \*<sup>4</sup>) and one programme aimed at children aged between 5 and 12 years old attending school and preschool in Ontago, New Zealand (nRCT [+] New Zealand: 4 sources \*<sup>1</sup>). One programme targeted children aged 6 to 9 years attending elementary school in Somerville, Massachusetts (nRCT [+] USA: Economos et al. 2007b). However, all interventions stated an aim to influence the wider community through the programme, including parents, child care centre workers, teachers and other members of the community.

\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

## Preventing Obesity: the effectiveness of a whole system approach

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

### ***Evidence statement 4: Evidence and range of whole system core features within obesity prevention programmes***

Of the 8 obesity prevention programmes included in the review (two BA: [-] USA (Drummond et al. 2009); [+] USA (Chomitz et al. 2010), three nRCT: [+] USA (Economos et al. 2007b); [+] Australia (Bell et al. 2008; Sanigorski et al. 2008); [+] New Zealand (4 sources\*<sup>1</sup>), one cBA [+] Australia (12 sources \*<sup>2</sup>), one longitudinal epidemiological study ([+] France (5 sources \*<sup>3</sup>) and one repeated cross-sectional survey ([+] France: 3 sources \*<sup>4</sup>), none of the programmes demonstrated evidence of **explicit recognition of the public health problem as a system**. Few of the programmes contained evidence of the majority of features, and, due to the inconsistency and lack of pattern in the ‘spread’ of features across programmes, it is difficult to suggest a clear overarching “direction of travel”.

Of the remaining 9 core features of systems working, all 8 obesity prevention programmes demonstrated inconsistent evidence of **local creativity**. Seven programmes demonstrated more robust evidence of **capacity building, robustness & sustainability** and **community engagement**, but this was still inconsistent across the groups and all these features did not appear across the same 7 programmes. Five obesity prevention programmes demonstrated inconsistent evidence of a focus on the **embeddedness of actions and policies**, and of **developing working relationships** within and between partners. Four of the obesity prevention programmes demonstrated inconsistent evidence of a focus on **enhancing communication** between actors and organisations within the system, **facilitative leadership** and the use of well-articulated methods for **monitoring and evaluation** of activities.

\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c;de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

### ***Evidence statement 5: Evidence and range of whole system core features within smoking prevention/cessation programmes***

Of the 2 smoking prevention/cessation programmes included in the review (one RCT [++])



## Preventing Obesity: the effectiveness of a whole system approach

USA & Canada: 9 sources <sup>\*5</sup>; one cBA [+] UK: Platt et al. 2003) neither of the programmes demonstrated evidence of explicit recognition of the public health problem as a system. Of the remaining 9 features of systems working, the two smoking prevention/cessation programmes demonstrated clear evidence of both **capacity building**, encouraging **local creativity, developing working relationships**, and **enhancing communication**. Across both programmes there was some but less consistent evidence of **community engagement** and **embeddedness of actions and policies**. One large smoking prevention/cessation programme (RCT [++] USA & Canada: 9 sources <sup>\*5</sup>) demonstrated some evidence of **facilitative leadership**. The other smoking prevention/cessation programme (cBA [+] UK: Platt et al. 2003) demonstrated some evidence of **robustness & sustainability**. Neither smoking programme displayed evidence of well articulated methods for ongoing **monitoring and evaluation** of activities.

<sup>\*5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

### ***Evidence statement 6: The effectiveness of community-wide obesity prevention programmes: anthropometric outcomes***

#### **Outcomes reported**

There was a wide variety of outcomes reported across the 8 programmes (two BA: [-] USA (Drummond et al. 2009); [+] USA (Chomitz et al. 2010), three nRCT: [+] USA (Economos et al. 2007b); [+] Australia (Bell et al. 2008; Sanigorski et al. 2008); [+] New Zealand (4 sources<sup>\*1</sup>), one cBA [+] Australia (12 sources <sup>\*2</sup>), one longitudinal epidemiological study ([+] France (5 sources <sup>\*3</sup>) and one repeated cross-sectional survey ([+] France: 3 sources <sup>\*4</sup>). Anthropometric outcomes reported were BMI and BMI-z scores, prevalence of children rated as overweight/obese, waist circumference and body weight.

#### **Strength of evidence**

Overall, there is evidence from a number of community-wide programmes that they can have a beneficial effect on reducing BMI scores in children.

There was a statistically significant and favourable change (over 3 years) in both the prevalence of overweight/obese children and the within-group change pre/post intervention in BMI-z scores in one Before and After (BA) study set in the USA [+] (Chomitz et al. 2010). Two studies in France (a longitudinal epidemiological study [+]: 5 sources <sup>\*3</sup>; and a repeated cross-sectional survey design [+]: 3 sources <sup>\*4</sup>) respectively found a statistically significant between-groups difference at post-intervention for prevalence of overweight or obese children, and a statistically significant within-groups change from pre- to post-intervention

## Preventing Obesity: the effectiveness of a whole system approach

both in BMI scores and for the prevalence of children rated as overweight or obese within the female group. A favourable change within the male group, but this was not statistically significant. Within the latter programme, a statistically significant pre- post- change was found in weight (kg) for females. In one controlled Before and After (cBA) study set in Australia [+] (12 sources \*<sup>2</sup>), there was a between groups difference post-intervention only in BMI and BMI-z scores within the two year old age group, with results favouring the intervention. However, within the 3.5 year old age group there was a statistically non-significant result which did not favour the intervention for BMI scores. Results for BMI-z scores and prevalence of children rated as obese or overweight favoured the intervention in all age groups, but these results were not statistically significant.

### WSA features

There is no clear evidence of a relationship between features of system working and programme effectiveness.

### Applicability to the UK

This evidence is judged to be partially applicable to communities of a similar size within the UK.

\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

### ***Evidence statement 7: The effectiveness of community-wide obesity prevention programmes: intermediate outcomes***

#### **Outcomes reported**

A diverse range of **intermediate outcomes** were reported in 4 studies (1 cBA study Australia [+]: 12 sources \*<sup>2</sup>; 2 BA studies USA [+]: Chomitz et al. 2010; USA [-]: Drummond et al. 2009; and 1 nRCT Australia [+]: Bell et al. 2008; Sanigorski et al. 2008) so were grouped by nutritional outcomes, physical activity outcomes and other outcomes.

#### **Strength of evidence**

Studies reporting **Intermediate outcomes** showed results favouring the intervention as between groups difference post-intervention only, between groups change pre- to post-intervention and within groups change pre- to post-intervention (1 cBA study Australia [+]: 12

## Preventing Obesity: the effectiveness of a whole system approach

sources <sup>\*2</sup>; 2 BA studies USA [+]:Chomitz et al. 2010; USA [-]:Drummond et al. 2009; and 1 nRCT Australia [+]:Bell et al. 2008; Sanigorski et al. 2008). Within nutritional measures, a between groups difference post-intervention only (over 3 years) was statistically significant in one controlled Before and After (cBA) study set in Australia ([+]: 12 sources <sup>\*2</sup>), where the number of servings each child reported having per day of less healthy foods reduced, and the number of daily servings of vegetables increased. Within another BA study set in the USA ([-]: Drummond et al. 2009) a statistically non-significant increase was observed post-intervention (over 9 months) in the number of nutritional best practices exhibited within childcare centres. Within physical activity measures, pre-/post-intervention change (over 3 years) was statistically significant in one Before and After (BA) study set in the USA ([+]:Chomitz et al. 2010) with a higher percentage of children passing a fitness test post-intervention than pre-intervention. Within another BA study set in the USA ([+]: Chomitz et al. 2010) a statistically non-significant increase was observed post-intervention (over 9 months) in the number of physical activity best practices exhibited within childcare centres. Within other measures, a decrease was reported (over 3 years) in one non-randomised controlled trial (nRCT) set in Australia ([+]: Bell et al. 2008; Sanigorski et al. 2008) in the number of children within the intervention group who reported unhappiness about body size and low self-esteem.

### WSA features

There is no clear evidence of a relationship between features of system working and programme effectiveness.

### Applicability to the UK

This evidence is judged to be partially applicable to communities of a similar size within the UK.

<sup>\*1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

<sup>\*2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c;de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

<sup>\*3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

<sup>\*4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

### ***Evidence statement 8: The effectiveness of community-wide obesity prevention programmes: process outcomes***

#### **Outcomes reported**

## Preventing Obesity: the effectiveness of a whole system approach

One programme set in Australia (cBA [+]: 12 sources <sup>*2</sup> ) reported <b>process outcomes</b> consisting of measures of parental awareness of the intervention, policies adopted or continued, and activities adopted or continued.
<b>Strength of evidence</b>
<b>Process outcomes</b> were only evaluated in one study, a controlled Before and After (cBA) set in Australia ([+]:12 sources <sup>*2</sup> ). Pre-/post-intervention change (over 3 years) was statistically significant in policy-related outcomes and activities, with improvements reported post-intervention. Parental awareness also increased from pre- to post-intervention, but statistical significance data were not reported.
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

<sup>\*2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

<b><i>Evidence statement 9: Smoking cessation outcomes</i></b>
Two programmes reported smoking cessation data consisting of one controlled Before & After (cBA) programme (cBA [+] UK: Platt et al. 2003) and one randomised controlled trial (RCT [++] USA & Canada: 12 sources <sup>*5</sup> ).
<b>Quit rates</b>
One programme (RCT [++] USA & Canada: 12 sources <sup>*5</sup> ) reported outcomes on between-group differences in quit rates by individuals (Intervention community quit rate=43.2% (N=2320) Comparison community quit rate=42.1% (N=2316)) and cohort, split into heavy smokers (= smoking $\geq 25$ cigarettes per day) and light/moderate smokers (= smoking $< 25$ cigarettes per day): Intervention community mean quit rate for heavy smoker cohort = 0.18 (p=0.007) Intervention community mean quit rate for light/moderate smoker cohort = 0.306 (p=0.030).
<b>Quit attempts in the past year</b>
One programme (cBA [+] UK: Platt et al. 2003) reported between groups difference in quit attempts using logistic regression analysis (odds ratio= 0.84; standard error = 0.11, 95% CI =

## Preventing Obesity: the effectiveness of a whole system approach

0.68 to 1.03; p=0.86).
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

\*<sup>5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

<b><i>Evidence statement 10: Smoking intermediate outcomes</i></b>
One programme (cBA [+] UK: Platt et al. 2003) reported smoking cessation intermediate outcomes consisting of stages of change (self), stages of change (community), smoking never allowed in the house, and local smoking restrictions often ignored. Using both unadjusted comparisons and logistical regression analysis there was no evidence of an intervention effect in the targeted community in relation to process indicators such as: readiness of the community to tackle smoking behaviour, attitudes to smoking in the house, and; the perception of smoking as a serious local problem. There were similar trends between wave 1 and wave 2 in both the intervention community and the three control communities.
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

<b><i>Evidence statement 11: Smoking process outcomes</i></b>
One programme (RCT [++] USA & Canada: 12 sources * <sup>5</sup> ) reported smoking cessation process outcomes relating to physicians surgeries and work practices, worksite environmental policies and smoking cessation activities, and duration of the effect of the intervention. Within physicians' surgeries, there was a statistically significant increase (p<0.05) in the number of intervention site physician practices which were more likely to adopt a number of anti-smoking policies, such as smoke-free offices, displaying anti-tobacco posters and assigning smoking cessation counsellors to patients.

## Preventing Obesity: the effectiveness of a whole system approach

There was a statistically non-significant *reduction* in the majority of worksite smoking policies and environment practices (such as the worksite having a written or restrictive smoking policy and the mean percentage of worksites reporting employees complying with worksite smoking policies) reported by intervention communities compared to those in control communities. There was a statistically significant difference between intervention worksites that attended a workshop on smoking ( $p=0.02$ ) compared to control worksites. Within cessation activities there was a statistically significant difference with intervention worksites reporting lower scores in the percentage of worksites offering quit-smoking classes and materials ( $p=0.03$ ), offering between-worksite competitions or participating in a community-wide quit smoking contest ( $p=0.06$ ) and participating in the Great American Smokeout/National Nonsmoking Week ( $p=0.07$ ).

Durability (defined by the study authors as some level of tobacco control activity similar to the intervention existing within the intervention community at follow-up) was investigated in intervention and control sites at 12 to 16 months and 2 years post-intervention. Comparative data was not reported in a number of duration measures, with only intervention group data provided. At the 2 year follow up, activities by treatment arm as stated by the 'Expert' subset of respondents (defined as people designated to be most likely to be informed about community tobacco control activities) reported a number of statistically non-significant differences between groups with intervention communities demonstrating higher levels of available smoking cessation information, presence of other community cessation events, activities in tobacco control addressing youth, combined youth events and enforcement of regulations against youth smoking.

### WSA features

There is no clear evidence of a relationship between features of system working and programme effectiveness.

### Applicability to the UK

This evidence is judged to be partially applicable to communities of a similar size within the UK.

\*<sup>5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

## Preventing Obesity: the effectiveness of a whole system approach

<p><b><i>Evidence statement 12: Relationship between system working and effectiveness</i></b></p> <p>Taking into account: the degree of variation across studies; the small sample size of eight programmes; and the range of outcomes reported; it is very difficult to draw conclusions regarding possible relationships between the presence of features of system working, and programme effectiveness.</p>
<p><b>Evidence of 9 out of 10 WSA features</b></p> <p>Only two programmes demonstrated the <b>strongest evidence for system working</b>. One cBA study [+] (12 sources *<sup>2</sup>) set in Australia explicitly describes nine out of the ten features of system working, and demonstrated statistically non-significant between group decreases in anthropometric outcomes. In intermediate outcomes, this programme demonstrated statistically non-significant between-group decreases favouring the intervention in those outcomes relating to physical activity, and statistically significant between-group decreases favouring the intervention in those outcomes relating to nutrition. The other study, an nRCT set in Australia ([+]: Bell et al. 2008; Sanigorski et al. 2008), shows clear evidence of six out of ten WSA features, and makes implicit reference to an additional three features. This study reports statistically non-significant between-group decreases in anthropometric outcomes. No intermediate outcomes are reported, but potential adverse impacts relating to unhappiness about body size and low self-esteem show statistically non-significant decreases within the intervention group.</p>
<p><b>Evidence of 5 to 7 out of 10 WSA features</b></p> <p>One nRCT set in the USA ([+]: Economos et al. 2007b) of the eight included programmes demonstrated weaker evidence for system working in indicating evidence of seven out of ten WSA features. One BA study based in the USA ([+]:Chomitz et al. 2010) explicitly describes three WSA features and makes implicit reference to another three features, and within anthropometric outcomes reported statistically significant pre-/post-intervention change in the prevalence of obese children. This study also reported a statistically non-significant pre-/post-intervention change in the number of fitness tests passed and a statistically significant pre-/post-intervention change in both the percentage of children passing five fitness tests and the percentage of children passing the endurance cardiovascular test. One other BA study based in the USA ([-]: Drummond et al. 2009) explicitly describes only two WSA features and makes implicit reference to another three features. No anthropometric outcomes were reported, but reported a statistically non-significant pre-/post-intervention increase in adherence to best practices by childcare centres (relating to nutrition and physical activity).</p>
<p><b>Evidence of 4 or less out of 10 WSA features</b></p>

## Preventing Obesity: the effectiveness of a whole system approach

One longitudinal epidemiological study based in France ([+]: 5 sources <sup>\*3</sup>) clearly demonstrated evidence of four features, and demonstrated unclear evidence of two additional features. Another, related, repeated cross-sectional survey also based in France ([+]: 3 sources <sup>\*4</sup>) demonstrated unclear evidence of only four features. One nRCT (New Zealand [+]: 4 sources <sup>\*1</sup>) provides unclear evidence of two features. Only the New Zealand study reported a *between group* statistically significant and favourable change in BMI-z scores. The two studies from France showed *pre-/post- reductions* in obesity prevalence, which were statistically significant for all children in one of the studies but only for girls in the other study.

<sup>\*1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

<sup>\*2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c;de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

<sup>\*3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

<sup>\*4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010



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## 3. Background

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### 3.1.1. Definition of whole system approaches

The starting point for this systematic review is the working definition of whole system approaches to tackling public health problems, which was the product of Review 1 and ongoing deliberations amongst the Programme Development Group (PDG). The resulting multi-dimensional definition (see Box 1 below) comprises nine attributes that have emerged as features of ‘whole system working’ within community settings, in addition to the first feature: the need for explicit recognition that the combinations of causes of the social/health problem are a ‘complex system’. However, as Review 1 found no examples of this latter feature in practical examples of a whole system approach for obesity prevention, we have relied on the remaining nine features of whole system working.

*Please note that even though the definitions of these WSA features have evolved during the course of this systematic review, this report and the research it presents is based on the definitions as they were at the beginning of the review process (as on the following page). These definitions of core features will continue to evolve throughout the course of this programme of reviews.*

## Preventing Obesity: the effectiveness of a whole system approach

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### Box 1. Original nine features of a whole system approach to tackling public health problems (version post-PDG1)

1. **Explicit recognition of the public health problem(s) as a system:** that is recognition of interacting and evolving system elements; self-regulation; synergy and emergent properties (see Review 1, Summary Statement 1)

**Whole systems working:** The principles of whole system working have explicitly informed the design and implementation of the programme, for example:

2. **Capacity building:** capacity building within communities and organisations was an explicit goal
3. **Local creativity:** local creativity and/or innovation was encouraged
4. **Relationships:** clear methods were used to develop working relationships, within and between organisations
5. **Engagement:** clear methods were used for engaging community members in programme development and delivery. Engagement of diverse people, organisations and sectors.
6. **Communication:** clear methods were used for enhancing communication between actors in the system
7. Focus on the **embeddedness of action and policies** for obesity prevention in organisations and systems.
8. Focus on the **robustness and sustainability** of the system to tackle obesity (this includes notions of the adaptability and learning capabilities of the systems/networks/partnerships established)
9. **Facilitative leadership** not necessarily located at any particular levels or organisations

## Preventing Obesity: the effectiveness of a whole system approach

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### Box 2. Final ten features of a whole system approach to tackling public health problems (version post-PDG2)

1. **Identifying a system:** Explicit recognition of the public health system with the interacting, self-regulating and evolving elements of a complex adaptive system. Recognition given that a wide range of bodies with no overt interest or objectives referring to public health may have a role in the system and therefore that the boundaries of the system may be broad.
2. **Capacity building:** An explicit goal to support communities and organisations within the system. *For example, increasing understanding about obesity in the community and by potential partner organisations or training for those in posts directly or indirectly related to obesity.*
3. **Creativity and innovation:** Mechanisms to support and encourage local creativity and/or innovation to address obesity. *For example, mechanisms which allow the local community to design locally relevant activities and solutions.*
4. **Relationships:** Methods of working and specific activities to develop and maintain effective relationships within and between organisations. *For example, establishing and maintaining relationships with organisations without a health remit or an overt focus on obesity.*
5. **Engagement:** Clear methods to enhance the capabilities of people, organisations and sectors to engage community members in programme development and delivery. *For example, sufficient time in projects allocated to ensuring that the community can be involved in planning and assessing services.*
6. **Communication:** Clear methods of communication between actors and organisations within the system. *For example, ensuring sufficient face-to-face meeting time for partners, having planned mechanisms for feeding back information about local successes or changes.*
7. **Embedded action and policies:** Practices explicitly set out for obesity prevention within organisations within the system. *For example, local strategic commitments to obesity, aligning with wider policies and drivers (such as planning or transport*

## Preventing Obesity: the effectiveness of a whole system approach

*policy) and ensuring obesity is an explicit concern for organisations without a health remit.*

8. **Robust and sustainable:** Clear strategies to resource existing and new projects and staff. *For example, contingency planning to manage risks.*
9. **Facilitative leadership:** Strong strategic support and appropriate resourcing developed at all levels. *For example, specific methods to facilitate and encourage bottom up solutions and activities.*
10. **Monitoring and evaluation:** Well articulated methods to provide ongoing feedback into the system, to drive change to enhance effectiveness and acceptability. *For example, developing action-learning or continuous improvement model for service delivery.*

### 3.1.2. Some preliminary considerations for this systematic review

The scope of systematic reviews of the effectiveness of health interventions can usually be defined according to relatively clear 'PICO' criteria: Population, Intervention, Comparator(s), and Outcomes. However, in public health, or for interventions relating to the organisation of care and health services, clearly defining the intervention or programme becomes more of a challenge. Review 1 (considered at the PDG1 meeting) provided an account of the features that 'whole system approaches' both should entail (in theory), and a summary description of a number of what community-wide and systems-based programmes aimed at obesity prevention which illustrate how this concept has been used in practice.

The motivation within public health generally, and in influential reports like the Foresight Report, to make greater use of 'whole system approaches' or 'systems thinking' seems to be based on a number of realisations and hopes. First, in contrast to conventional views about characterising 'what works' in health care, there is a belief that for complex socially, environmentally and behaviourally caused problems like obesity that are created and sustained at multiple levels, it is not (only) *what you do* that can have desired impacts (i.e. not just the specific bundle of different activities and policy changes) but also *the way that you do it*, both in terms of how

## Preventing Obesity: the effectiveness of a whole system approach

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organisations aim to develop and implement activities, and the nature of the activities undertaken.

Second, it is based in the commonsense notion that the solutions to problems lie in understanding the (system of) causes of the problems. Conversely, using multiple cross-sector strategies to tackle complex problems like smoking or obesity *without* any understanding of the webs of interrelated and multi-level causes of the problem are far less likely to be successful.

Third, a key attraction of systems approaches to such causally complex and policy-resistant public health problems appears to be the notion that the ‘solution’ to such complex problems lies within the capabilities of the system itself. In other words, compared with the usual conceptualisation of health interventions – where the solution is an *externally imposed and entirely new* set of resources and actions (drugs, clinical monitoring, follow-up regimes etc.), delivered from outside the disease process – with systems thinking and systems working the mechanisms of change are largely believed to already lie within the system, but they need to be activated or mobilised.

This all creates novel challenges for a systematic review of effectiveness studies. How do you conduct a review of the effectiveness of a class of public health programmes where their outcomes may be as much determined by *the way they the programmes were developed and delivered*, as by the specific packages of actions or policies that they resulted in? There are precedents of effectiveness reviews of broad public health approaches – such as community engagement and community development approaches – but these still struggle to separate the relative importance of the principles and processes of achieving community-wide changes, and the specific actions and policies implemented (e.g. what the community engagement was about).

At the very least, it requires reviews of such approaches to comprehensively describe both *what* types of specific prevention activities and policies were delivered and also *how* the overall programme was conceived, developed and evolved (including the presence or absence of features of ‘systems working’). Of course, given any discovered variations in effectiveness between studies and programmes, this will inevitably multiply the challenges of attributing such variations to either the different

## Preventing Obesity: the effectiveness of a whole system approach

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component prevention strategies, the different ways they were developed and delivered, or a combination of both.

### 3.1.3. Following the problem/outcomes or following the mechanisms of change?

The duality of understanding public health programmes (and their effectiveness) as the combination of both the packages of particular strategies and interventions, *and* the principles and processes for developing and implementing them, also creates difficult choices about what evidence (which studies) should be included in a systematic review. The key choice is between trying to gather and synthesise studies either according to the aims of the strategies (e.g. obesity prevention strategies) or gathering and synthesising evidence relating to the supposed mechanisms of action (i.e. whole systems approaches, or – more likely - multi-level community-wide approaches exhibiting some features of systems working). In the end, this choice has to be based on some assessment of which of these two aspects of programmes is believed to be more highly associated with the variations in effectiveness across included studies.

### 3.2. Rationale for including smoking prevention/cessation programmes

Given the value of a review that included studies with the same broad mechanisms of change (i.e. systems approaches), and low expectations that there would be very many evaluated examples of WSA approaches to obesity prevention, colleagues at CPHE advised that smoking prevention/cessation research may offer more established exemplars of the use of systems thinking in the design and implementation of prevention programmes. This view seemed to be supported by the common focus on smoking prevention and tobacco control in papers in an early 2010 special issue of the *American Journal of Public Health* (Mabry et al. 2010; Marcus et al. 2010). Therefore, from the outset this review aimed to search for and include effectiveness studies about relevant community-wide smoking prevention programmes as well as obesity prevention programmes (see Review Protocol in Appendix 1).

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## **4. Aims**

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This systematic review aimed to systematically identify, summarise, and synthesise relevant evaluation studies in order to answer the following two review questions.

### **4.1. Review questions**

Q1. How does the effectiveness, implementation and sustainability of whole system or whole community approaches to preventing obesity appear to vary in relation to:

- The specific combination of local actions and local strategies used to try and bring about change
- The characteristics of the population and/or places targeted (including level of social disadvantage)
- The local and national policy context
- Other factors which influence the effectiveness, implementation and sustainability of the relevant actions and strategies

Q2. How does the effectiveness, implementation and sustainability of whole system approaches to preventing smoking appear to vary in relation to the same factors listed for Q1.

NB. By “effectiveness”, “implementation” or “sustainability” we do not imply that only positive or intended outcomes will be of interest. Included studies/interventions will also be examined for evidence of adverse or unintended consequences. Note also that effectiveness will be defined in terms of final health outcomes (e.g. mean BMI, obesity rates) intermediate outcomes which reflect which reflect features of whole systems working (e.g. indicators of successful community engagement; indicators of capacity building activity).

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## 5. Methods

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### 5.1. Identification of evidence

#### 5.1.1. Search strategy

Building on search terms and programme names identified through searches already conducted in Review 1, searches of relevant bibliographic databases and selected websites were conducted in order to identify relevant primary research. This was supplemented by citation searching and communication with experts and/or organisations involved in the relevant research or policy areas.

A separate and more detailed Search Protocol and Search Strategy were agreed separately between this project's information specialists (SB & AF-S at West Midlands Health Technology Assessment Collaboration, University of Birmingham) and the relevant CPHE analysts and information specialists. Given the iterative nature of this review and the potential programmes to be covered, the Search Strategies were agreed separately from the Search Protocol (which provided the overall framework of what types of searches could be conducted amongst which databases and sources, and using which key search terms). See Appendix 2 for full details.

#### 5.1.2. Search processes and methods

Searches covered bibliographic databases and grey literature sources, particularly websites. A broad strategy was devised comprising a combination of textwords and index terms to express the intervention (whole system approach) and the populations (obesity prevention and smoking prevention). Separate strategies were run for each of the two topics, adapted appropriately to the various databases.

Databases were searched and search terms were detailed separately in the search protocol and strategy. Grey literature (such as unpublished reports, or information on websites) was mainly searched via internet searches, and through contact (mainly e-mail) with authors and other experts or contacts.

Two information specialists (SB & AF-S) conducted the searches alongside the two reviewers (RA & HH) undertaking the review. All searches were fully documented



## Preventing Obesity: the effectiveness of a whole system approach

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(databases and websites used, strategies and dates of searches). All deduplicated bibliographic search results and final included references were stored on a Reference Manager database.

### Contacting authors

At the full text stage some papers/sources documented prevention programmes which were potentially includable in terms of their programme characteristics (i.e. focused on obesity prevention or smoking prevention, community wide, and multi-level) but which were clearly not evaluation studies in the document being assessed for inclusion. In these situations we e-mailed the paper authors (where one was shown) to ask whether a comparative evaluation of the effectiveness of the programme exists.

### Contacting other experts and contacts

We e-mailed some authors who have written key recent editorials about whole systems thinking and working in public health (Dr Patti Mabry and Dr Stephen Marcus of the US National Institutes of Health) (Mabry et al. 2010; Marcus et al. 2010). (Their replies did not yield any studies or programmes which we had not already identified through our other searches). We also e-mailed contacts at the European EPODE Network (EEN), who kindly supplied two research abstracts and a journal article about the predecessor programme to EPODE in two towns in Northern France (Romon et al. 2008).

We also e-mailed the Department of Health leads for all nine ongoing Healthy Town initiatives in England (notified by CPHE).

#### 5.1.2.1. Screening

Title and abstract screening was carried out between the two reviewers (HH and RA) with consistency checking carried out on 10% of the decisions made. Where research methods used or the intervention being evaluated was not clear from the title or abstract, the full text paper was ordered. Papers that were excluded at title/abstract screening under the inclusion/exclusion criteria, but warranted further study of their references - and for interest to inform the review - , were also marked for retrieval at full text.

## Preventing Obesity: the effectiveness of a whole system approach

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Full text screening was carried out by the same two researchers (HH & RA); any adjudication in case of disagreement would have been carried out by a third reviewer (RG) but this was not required.

As part of the screening process, if at the full text screening stage an intervention appeared to fit within all criteria but lacked effectiveness data, the researchers contacted study authors by email (where appropriate) to enquire about the presence and availability of any effectiveness studies or data which would render the intervention includeable in our review.

### 5.1.3. Inclusion and exclusion criteria

#### 5.1.3.1. Inclusion criteria

Initially included at the full text stage were studies of **obesity prevention interventions** demonstrating **some core features** of whole system approaches (as listed in Box 1 p.26), *OR* studies of **smoking prevention interventions** demonstrating **many core features** of whole system approaches, *AND* were:

- Implemented in **whole populations or communities** (i.e. whether they are or obese, overweight (or smokers) or not); *AND* which;
- Report any of the **outcome measures** or other indicators of an intervention's success/failure listed above in Section 10, *AND* using;
- **Comparative study designs**: Evaluations (prospective or retrospective) using comparative designs (randomized controlled trials, non-randomized controlled trials, before and after studies, or natural experiments, time series).

At first, through discussion between reviewers, it was decided that interventions exhibiting less than four features would be excluded in order to allow deeper analysis of programmes featuring a more extensive range of core features for a whole system approach to obesity and/or the prevention of smoking. However, following PDG discussion, the three obesity prevention programmes excluded on this basis were reinstated, in order to capture the full range of programmes and features identified.

**5.1.3.2. Exclusion criteria**

Exclusion criteria covered:

- Empirical studies which only document the design and implementation of interventions without reporting evidence of the outcomes listed or which do not show time trends or report other (e.g. historical) control data for the outcomes of interest.
- Empirical studies which only present the effectiveness or successful implementation of individual interventions which were part of a broader strategy.
- Studies of interventions where EITHER obesity prevention, encouraging physical activity, or encouraging a healthy diet (OR smoking prevention), are not a central or major aim of the intervention.

**5.2. Screening to identify relevant studies**

Screening of search hits from the bibliographic database searches took place in three stages (rather than the usual two stages):

**Stage 1:** Examining the titles and abstracts of hits and identifying papers which could not be reliably ruled out as potentially includable;

**Stage 2:** Obtaining those potentially includable papers or reports in full text, and assessing them against the exclusion and inclusion criteria specified in the protocol. At this stage this meant ruling out those that were:

- not aimed at obesity prevention or smoking prevention
- not effectiveness evaluations

However, at this second stage, a judgement was not immediately made on the extent to which the programme's conception, design and delivery represented a 'whole system approach'. Instead, the programme was assessed as a 'potential include' if it was clearly community-wide (i.e. targeting all people in a specific geographical area) and if it was clearly multi-level or multi-faceted in some sense (e.g. different activities

## Preventing Obesity: the effectiveness of a whole system approach

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delivered in a variety of settings, such as schools, workplaces and sports clubs). This meant a great many studies of programmes were excluded which had been labelled as community-based or community-wide, but which in fact were single strategy interventions (e.g. only social marketing, or only peer-education) or programmes delivered in a single setting (e.g. only in the schools, or only in the churches in a given community).

**Stage 3:** Only those full-text studies which were included at stage 2 as being *both* genuinely community-wide and multi-level (as described above) were assessed for evidence of the ten features of a ‘whole system approach’ (the ‘WSA features’) (see Box 1). This aspect of screening in fact amounted to a form of mapping review of the potentially includable programmes and their related papers. The resulting tables of information form a useful overview of the extent to which community-wide multi-level obesity prevention and smoking prevention programmes exhibit different features of systems working.

Therefore, papers could be excluded on the basis of a feature of the paper (e.g. published before 1990, or not an effectiveness evaluation) or because of the nature of the prevention programme described (e.g. not community-wide or multi-level). This meant that we would sometimes exclude papers at full text stage (stage 2 above) where the description of the programme looked like it should be an *included programme*, but where the paper itself was not an effectiveness evaluation (perhaps it was an editorial, or a study protocol, or a description of how the programme developed). On ten of these occasions, we contacted the authors of the relevant paper or conference abstract (by e-mail) to ask if, to their knowledge, there were any published or unpublished (i) effectiveness evaluations (ii) cost-effectiveness studies or cost studies, or (iii) qualitative research, relating to the given community-wide multi-level prevention programme which would render their research includable in our review.

When an initiative was identified as containing potentially includable effectiveness data, other sources were used – where possible – to assess suitability, rather than simply relying on the often-sparse descriptions of whole interventions contained within evaluation papers themselves.

**5.2.1. Process of assessing presence of WSA features**

For each potentially includable effectiveness evaluation which was deemed to be a community-wide multi-level obesity prevention or smoking cessation/prevention programme (i.e. after stage 2), we assessed which - if any - of the nine defined features of a 'whole system approach' (the 'WSA features') were present. Through notation in the margins of papers, we were able to build a detailed picture of a) whether a feature or key element was evident in a described programme, and b) how clear this evidence was (● ○). Since this was done separately by two reviewers (HH and RA) - and because these features are themselves quite hard to fully define or identify - we adopted the following strategies to try and ensure consistency in our judgements about the presence of these features:

1. Two out of six of the assessments of papers judged includable by one reviewer (HH or RA) were blind assessed by the other reviewer. Differences were discussed and decisions revised.
2. We performed unblinded checking of each other's remaining assessments (examining the codings on relevant sections on the paper hard copies)
3. Alongside this process we created a fuller annotated description of the nine original core WSA features, in order to clarify (with examples) what should and what should not count as demonstration of each feature.
4. Following discussion by the PDG, an additional WSA feature was created - "monitoring and evaluation" (see Box 1) – and incorporated into the analysis of the included obesity prevention programmes.

Despite these strategies, other reviewers assessing the same papers may have attributed different WSA features to our provisionally included studies.

Initially, through discussion between reviewers, it was decided that interventions exhibiting less than four features would be excluded in order to allow deeper analysis of programmes featuring a more extensive range of core features for a whole system approach to obesity and/or the prevention of smoking. However, following PDG discussion, the three obesity prevention programmes excluded on this basis were reinstated, in order to capture the full range of programmes and features identified.

**5.2.2. Other judgements made during the iterative screening process****5.2.2.1. Exclusion of population-based CVD prevention programmes**

Some of the search hits from the obesity prevention and smoking prevention bibliographic searches were to do with the well-known large, and typically quite old, population programmes to prevent CVD (e.g. North Karelia project, the Stanford Five Cities Programme). We decided that it would be inappropriate to include evaluations of such programmes in the review mainly because one of our review's agreed exclusion criteria was to exclude:

“Studies of interventions where EITHER obesity prevention, encouraging physical activity, or encouraging a healthy diet, OR smoking prevention, were not a central or major aim of the intervention”.

From the abstracts of many of these CVD programmes, it was also apparent that the reporting of these studies generally focused more on hypertension or (for example) blood glucose outcomes than weight or BMI outcomes. Also, the programmes themselves typically involved screening for individuals at high risk of developing cardio-vascular disease, and then targeting health promotion activities and health monitoring activities at those individuals. They were not therefore community-wide in the sense that they were targeting the behaviours of all people in the relevant community.

**5.2.2.2. Consideration of physical activity only or diet only community-wide interventions**

As a review team we had made the initial assumption that in order to be considered to have adopted a whole system approach to obesity prevention, a programme would need to contain prevention strategies which tackled both sides of the energy balance; physical activity and diet. However, after stage 3 of screening, and in discussion with the CPHE team (teleconference 11<sup>th</sup> August) we decided that it would be useful to include community-wide multi-level programmes aimed solely at either increasing physical activity or improving diet. We therefore re-screened both full-text and title-and-abstract exclusions of papers which had been excluded because they focussed

## Preventing Obesity: the effectiveness of a whole system approach

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solely on either physical activity or diet. This involved re-screening 57 titles and abstracts and full text screening of four papers in order to see whether they were also genuinely of multi-level community-wide programmes. Given the timing of these inclusions at such an advanced stage within the review process, this re-screening was conducted with close involvement of CPHE analysts.

Ultimately, this re-screening did not lead to any new programmes being included in our review for several reasons; one source was not an effectiveness/evaluation study; two sources did not use a comparative study design; and one source did not clearly address obesity prevention (see Appendix 10).

### 5.2.2.3. Summary of the searches conducted

## Preventing Obesity: the effectiveness of a whole system approach

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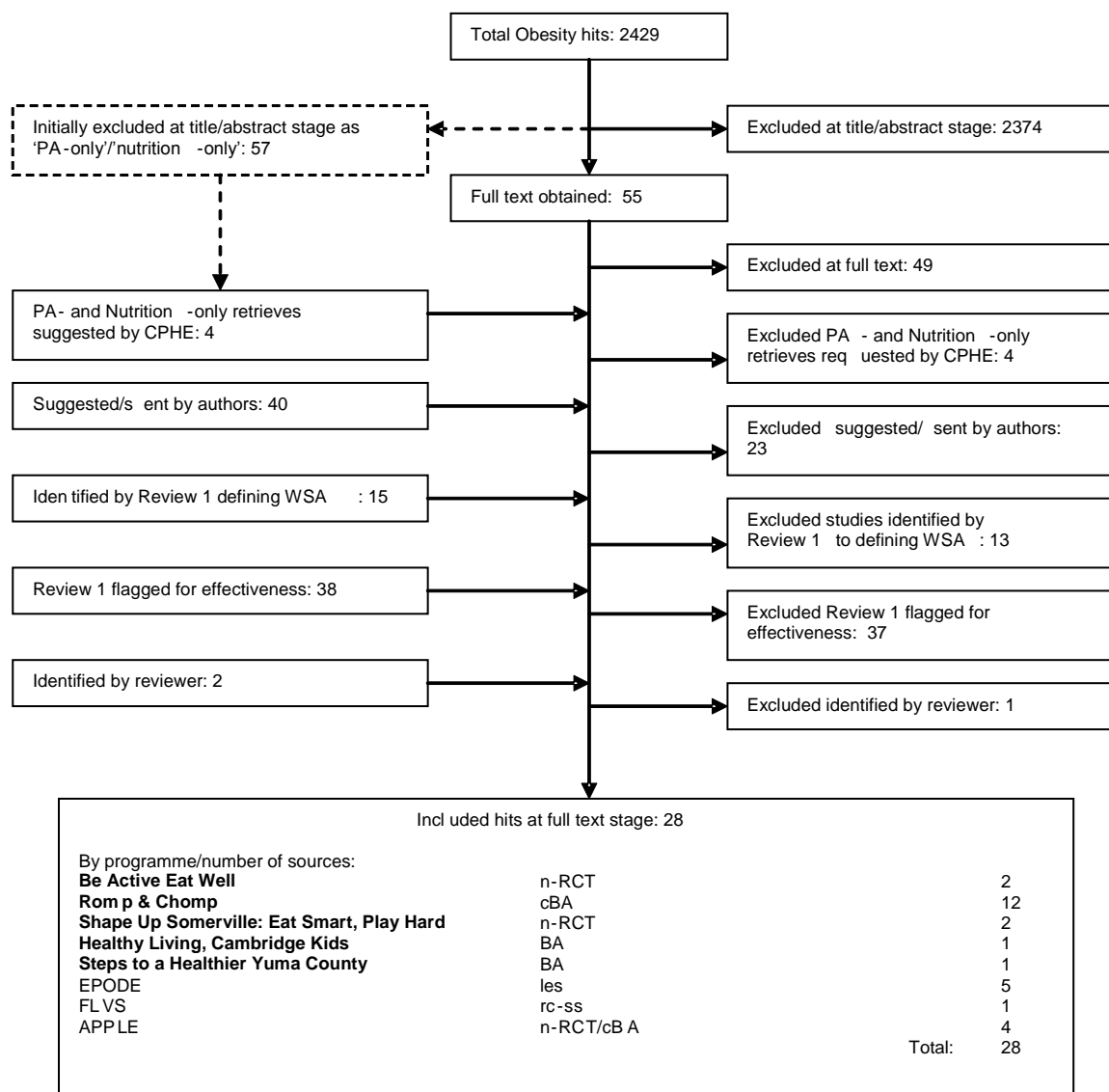
Figure 1 (obesity searches) and Figure 2 (smoking searches) on the following two pages present flow charts of the whole searching and paper/report selection processes from the initial main bibliographic searches up to final selection of included studies. The central 'spine' of these diagrams follows the results of the main bibliographic searches, while titles/abstracts or full papers from other sources for potential inclusion are shown down the left-hand side.

Because the presence of features of a 'whole system approach' played an important part in inclusion decisions, the bottom two panels in each flow diagram more explicitly show the number and identity of the included community-wide programmes (some of which were documented in two or more papers/reports).



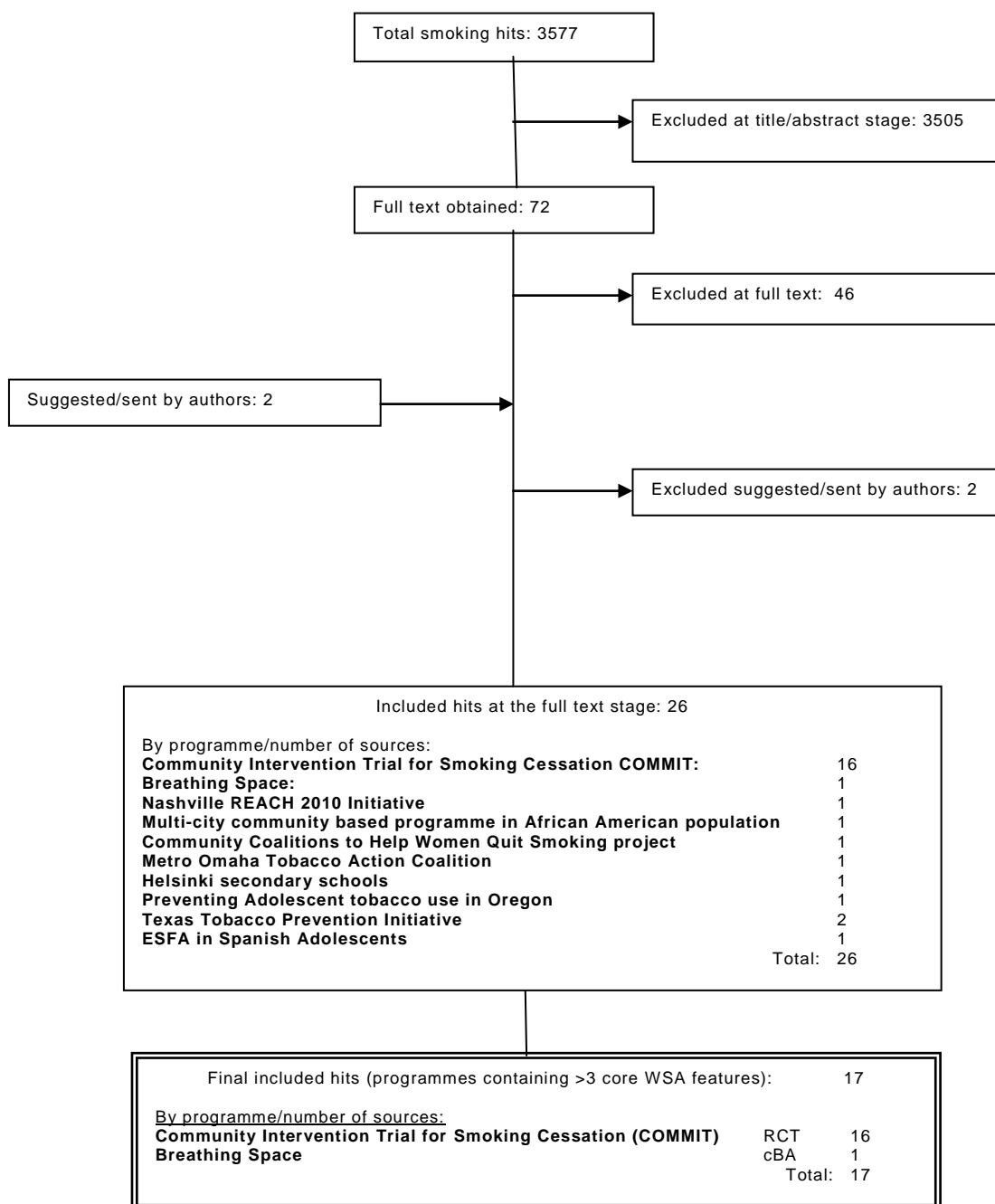
Preventing Obesity: the effectiveness of a whole system approach

Figure 1: Review flowchart – Obesity prevention searches



Abbreviations: WSA = Whole System Approach; PA = Physical Activity; n-RCT = non-randomised controlled trial; BA = uncontrolled before & after study; cBA = controlled before & after study; BAEW = Be Active Eat Well, Victoria; R&C = Romp & Chomp, Victoria; KGFYL = Kids Go For Your Life!, Victoria; CPHE = Centre for Public Health Excellence (NICE); les = longitudinal epidemiological study; rc-ss = repeated cross-sectional survey

Figure 2. Review flowchart – Smoking cessation searches



Abbreviations: WSA = Whole System Approach; RCT = randomised controlled trial; cBA = controlled before & after study.

## Preventing Obesity: the effectiveness of a whole system approach

### 5.3. Methods of analysis/synthesis

#### 5.3.1. Data extraction & quality assessment

Table 1 below shows the standard data extraction categories used in the form created and piloted by the two reviewers (HC and HH).

**Table 1. Categories under which information was extracted from included sources**

<b>Programme focus</b>	<b>Study details</b>	<b>Whole system approach</b>
Intervention name	Study name (if different) [year]	Does the programme use the language of 'whole system' or 'whole community' approaches?
Intervention location	Setting (e.g. school, community, etc.)	Levels of action
Year/ timescale over which implemented	Author (year) plus associated paper/source + paper/source focus	Collections of organisations/partners/groups of actors involved
Target population (plus population number, town area)	Aim of study	Programme components
Theoretical perspective	Study design	Core feature descriptions:
Was local knowledge used?	Study population (age, gender, socio-economic status, other relevant characteristics)	- System recognition
Was local knowledge used in the design and/or delivery of the programme?	Source of funding	- Capacity building
Policy context	'Lessons' for the evaluation of obesity prevention programmes	- Local creativity
Programme delivery	Barriers and facilitators	- Relationships
Outcomes:		- Community engagement
Obesity: Anthropometric measures, Physical activity measures, Diet measures		- Communication
Smoking: Prevalence of smoking, Quit rates		- Embeddedness
Both smoking and obesity:		- Robustness & sustainability
- Quantitative/qualitative changes in measures of attitudes and awareness		- Facilitative leadership
- Indicators of successful implementation or sustainability		- Monitoring & evaluation

## Preventing Obesity: the effectiveness of a whole system approach

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Two researchers (HH and HC) then carried out quality assessment from 36 sources, covering the seven provisionally included interventions. Consistency checks were carried out between the two researchers on a minimum 10% of extractions and appraisals, and all extractions and appraisals were checked for accuracy and relevance by one other reviewer (HC, RA or HH).

Three additional programmes (FLVS, EPODE and APPLE) were introduced at a late stage to the final list of included programmes. Evaluation data on FLVS and EPODE was received late in the reviewing process, and APPLE programme data was initially excluded on the basis of containing insufficient evidence of WSA features. These programmes were therefore fully integrated into the reviewing and analytical process and data is presented together with the other five obesity prevention programmes.

All included reports were quality appraised using the revised GATE checklist to assess the quality of comparative quantitative studies (NICE, 2009). On the basis of assessing studies against a number of questions each study is given an overall grading for its internal validity<sup>1</sup> and its external validity<sup>2</sup>. The grading is as follows:

- |    |   |
|----|---|
| ++ | All or most of the criteria have been fulfilled. Where they have not been fulfilled the study conclusions are thought <b>very unlikely</b> to alter.                          |
| +  | Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought <b>unlikely</b> to alter the study conclusions. |
| -  | Few or no criteria have been fulfilled. The study conclusions are thought <b>likely or very likely</b> to alter.  |

### 5.3.2. Data synthesis

Synthesis was achieved primarily through narrative means, although tables and graphs were used for those outcomes which were more comparable or conversely, in some cases, to illustrate the wide variation in outcomes and results. Meta-analysis

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<sup>1</sup> Internal validity is here defined as: the study has been carried out carefully, and that the outcomes are likely to be attributable to the intervention being assessed, rather than some other (often unidentified) factors.

<sup>2</sup> External validity is here defined as: the extent to which the results of a study are generalisable beyond the confines of the study to the study's source population.

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(the statistical pooling of study results) was not possible. Finally, findings are combined and summarised in Evidence Statements as recommended by NICE public health methods.

Preventing Obesity: the effectiveness of a whole system approach

Table 2. 'Core features' programme overview – obesity prevention programmes

Programme name; country	Levels of action (e.g. Individual, Family, School, Comm., PH policy)	Sectors involved (Describe, e.g. Local Authority Planning dept.)	System recognition	Capacity building	Local creativity	Relationships	Community engagement	Communication	Embeddedness	Robustness & sustainability	Facilitative leadership	Monitoring & Evaluation
<b>OBESITY PREVENTION</b>												
<b>Romp &amp; Chomp;</b> Australia	Individual Family School Community PH policy	Numerous local authorities, state authorities, primary and secondary schools, community agencies and families – see individual interventions for details	●	●	●	●	●	●	●	●	●	●
<b>Be Active, Eat Well;</b> Australia	PH policy		●	●	●	●	○	○	●	○	●	●
<b>Shape Up Somerville: Eat Smart, Play Hard;</b> USA	Individual Family School Community	Children, Parents, Teachers, School food service providers, City department, Policy makers, Healthcare providers, Before- and after-school programs Restaurants, Media Joseph A. Curtatone, the new Mayor of Somerville, and Lawrence S. Bacow, the President of Tufts University	●	●	●	●	○	○	●	○		
<b>Healthy Living, Cambridge Kids;</b> USA	Individual Family School Community PH policy	Cambridge Public Schools (CPS), Cambridge Schools Committee, Cambridge City, Institute for Community Health, School Health Cambridge Public Health Department, Parents of children attending schools, Researchers Later expanded to include: CitySprouts (gardening organisation), Cambridge Department of Human Service Programs, Cambridge Green Streets Initiative, Federation of Massachusetts Farmers' Markets	●	●	○	●		○	○			
<b>Steps to a Healthier Yuma County;</b> USA	Individual Family School Community PH policy	Yuma County Public Health Services Community Nutrition Arizona Nutrition Network Women Infants and Children program, Health District	●	○	○	●			○			
<b>EPODE;</b> Europe	Individual Family School Community PH Policy	EPODE team (incl. National Coordination Team, Local Authority Leaders (Mayors), Local Programme Managers), Schools (including extra-curricular, school catering), Health organisations Health professionals, Infancy professionals Network of associations, Shops, owners and local producers, Media, Other "local stakeholders", "facilities", and "decision makers"	●	●	○	○			●		●	
<b>FLVS;</b> France	Individual Family School Community	Schools, local stakeholders	○	○					○		○	
<b>The APPLE project;</b> NZ	Individual Family School Community	University of Otago; Schools serving the Otago area (n=4 intervention schools and n=3 control schools)			○		○					

Key:

- - means of attaining programme element explicitly described, or clearly stated as a goal
- - programme element mentioned, but means of attaining not described
- Comm. - community
- PH policy- local Public Health policy

## Preventing Obesity: the effectiveness of a whole system approach

Table 3 'Core features' programme overview – smoking cessation programmes

Programme name; country	Levels of action (e.g. Individual, Family, School, Comm., PH policy)	Sectors involved (Describe, e.g. Local Authority Planning dpt.)	System recognition	Capacity building	Local creativity	Relationships	Community engagement	Communication	Embeddedness	Robustness & sustainability	Facilitative leadership	Monitoring & evaluation
<b>SMOKING</b>												
<b>COMMIT<sup>a</sup>; USA &amp; Canada</b>	Individual, Family, School, Community, PH policy	Too numerous to list – see data extraction form in appendix for full list		●	●	●	●	●	○		○	
<b>Breathing Space; UK</b>	Individual, Family, School, Community	Wester Hailes Health Agency; Wester Hailes Urban Regeneration Partnership; Lothian Health Board;		●	●	●	○	●	●	●		
Nashville REACH 2010 Initiative; USA	Individual, Family, School, Community, PH policy	Smoke Free Nashville (a community coalition comprised of representatives from business, grassroots and not for profit organizations), American Cancer Society, American Lung Association, and Tennessee Department of Health;		●		●	●					
Multi-city community based programme in African American population; USA	Community, School, Media	University of Massachusetts Community: Professional Advisory Committees set up; social groups		●		●		●				
Community Coalitions to Help Women Quit Smoking project; USA	Media, individual	Not clear. But 5 working groups established covering: support systems, health professionals, educators, worksites, and mass media		●		○	●					

**Preventing Obesity: the effectiveness of a whole system approach**

Programme name; country	Levels of action (e.g. Individual, Family, School, Comm., PH policy)	Sectors involved (Describe, e.g. Local Authority Planning dpt.)	System recognition	Capacity building	Local creativity	Relationships	Community engagement	Communication	Embeddedness	Robustness & sustainability	Facilitative leadership	Monitoring & evaluation
Texas Tobacco Prevention Initiative; USA	Individual, Family, School Community	Texas Dept. of Health; University of Texas in Austin; University of Texas Health Science Center at Houston School of Public Health		○							●	
Metro Omaha Tobacco Action Coalition; USA	Individual, Community, PH policy				●	○						
in Helsinki secondary schools; Finland	School, Community, PH Policy	Education (Teachers), church (camp leaders), Dentists		●								
Preventing Adolescent tobacco use in Oregon; USA	Individual, Family, School, Community, PH policy				●							
ESFA in Spanish Adolescents	School, Community, PH Policy	Education (schools), Youth clubs, Retailers, cessation programme (provider not stated)										

<sup>a</sup> Community Intervention Trial for Smoking Cessation

Key:

- - means of attaining programme element explicitly described, or clearly stated as a goal
- - programme element mentioned, but means of attaining not described
- Comm. - community
- PH policy- local Public Health policy



## 6. Results

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### 6.1. Identified reports

#### 6.1.1. Abstract/title screening

##### Obesity prevention

Two thousand, four hundred and twenty-nine hits were originally identified by our information specialists during the obesity-related searches. Two reviewers (RA and HH) excluded 2,374 sources according to the exclusion criteria laid out in the review protocol (see Appendix 1) and coded according to the abstract/title inclusion/exclusion criteria agreed between the reviewers beforehand.

##### Smoking prevention/cessation

Three thousand, five hundred and seventy-seven hits were originally identified by our information specialists during the smoking prevention/cessation-related searches. Two reviewers (RA and HH) excluded 3,505 sources according to the exclusion criteria laid out in the study protocol (see Appendix 2) and coded according to the abstract/title inclusion/exclusion criteria agreed between the reviewers beforehand.

#### 6.1.2. Full text screening

##### Obesity prevention

There were 55 full text obesity-related sources obtained for full text screening, which was carried out by the same two reviewers. Screening criteria for full text screening (see Appendix 6) was agreed between reviewers and was developed from the screening criteria used at the Abstract/title screening stage.

##### Smoking prevention/cessation

There were 72 full text smoking prevention/cessation-related sources obtained for full text screening, which was carried out by the same two reviewers. Screening criteria for full text screening (see Appendix 6) was agreed between reviewers and was developed from the screening criteria used at the Abstract/title screening stage.

## Preventing Obesity: the effectiveness of a whole system approach

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### 6.1.3. Excluded programmes exhibiting less than four WSA features

At the outset, all obesity prevention and smoking prevention/cessation programmes identified as initial includes were then assessed for evidence of WSA features (see Table 2 and Table 3), and those programmes that featured less than four WSA features were then excluded on that basis. However, following guidance from the PDG, all obesity prevention programmes excluded for these reasons were reinstated as included programmes in order to capture the full range of evidence of WSA features. Full references and abstracts for the excluded programmes (eight smoking cessation-related programmes) can be found in Appendix 11.

### 6.1.4. Included reports

Using the third screening step discussed in the Methods section, we concentrated on seven interventions (within 36 sources) which exhibited evidence of four or more core features of a whole system approach (see Table 2 and Table 3). These programmes were:

#### Obesity prevention

- ‘Be Active, Eat Well’ (2 sources: Bell et al. 2008; Sanigorski et al. 2008)
- ‘Romp & Chomp’ (12 sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b)
- ‘Shape Up, Somerville: Eat Smart, Play Hard’ (1 source: Economos et al. 2007b)
- ‘Healthy Living, Cambridge Kids’ (1 source: Chomitz et al. 2010)
- ‘Steps to a Healthier Yuma County’ (1 source: Drummond et al. 2009)

## Preventing Obesity: the effectiveness of a whole system approach

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### Smoking prevention

- ‘COMMIT’ (9 sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000)
- ‘Breathing Space’ (1 source: Platt et al. 2003)

#### 6.1.5. Reinstated obesity prevention programmes

Shortly before submission of our draft report, the review team were sent details of two programmes (EPODE and FLVS) by contacts at the European EPODE Network (EEN). The data relating to these programmes were extracted and quality-assessed in the same way as other included studies in this review. Initially these programmes were judged to exhibit very few of the defined core features of a whole system approach and so were excluded on this basis. However, following advice from the PDG these studies were reinstated to the final analysis and – along with the initially-excluded APPLE programme – joined the other included obesity prevention programmes, making eight included obesity prevention programmes in total.

As programmes targeted towards obesity prevention were the primary focus of this review, it was not judged to be necessary to reinstate those smoking cessation/prevention programmes previously excluded on the basis of exhibiting four or more features of systems working.

#### 6.2. Overview of included programme characteristics

See Table 4 below for a full overview of WSA features exhibited alongside results for the obesity prevention programmes.

Preventing Obesity: the effectiveness of a whole system approach

Table 4. Overview of WSA features exhibited by programme and study results

Programme name country (study design)	System recognition	Capacity building	Local creativity	Relationships	Community engagement	Communication	Embeddedness	Robustness & sustainability	Facilitative leadership	Monitoring and Evaluation	Anthropometric outcomes				Intermediate outcomes		
											BMI	BMI-z	Prevalence of children rated as overweight/obese	Other	Nutrition	Physical activity	Other
Romp & Chomp Australia (cBA)		●	●	●	●	●	●	●	●	●	2 yrs old	Between groups difference at post-intervention: ↑↑	Between groups difference at post-intervention: ↑	Between groups difference at post-intervention: ↑	Between groups difference at post-intervention: N° servings of packaged snacks/cordial/ fruit juice: ↑↑ Between groups difference at post-intervention: No. servings of vegetables per day: ↑↑	Between groups difference at post-intervention: No. trips to playground/park/ pool: ↑ Between groups difference at post-intervention: Time spent watching TV: ↑	
											3.5 yrs old	Between groups difference at post-intervention: ↓	Between groups difference at post-intervention: ↑	Between groups difference at post-intervention: ↑			
Be Active, Eat Well Australia (nRCT)		●	●	●	●	○	○	●	○	●	Between groups change pre/post: ↑	Between groups change pre/post: ↑	Between groups change pre/post: ↑	Between groups change pre/post: waist circ. ↑ Between groups: weight in kg ↑		Between groups change pre/post: child's unhappiness with body size: ↑ Between groups change pre/post: child not feeling good about themselves: ↑	
Shape up Somerville: Eat Smart, Play Hard USA (nRCT)		●	●		●	○	○	●	○		Between groups change pre/post: ↑						

## Results

### Preventing Obesity: the effectiveness of a whole system approach

Programme name country (study design)	System recognition	Capacity building	Local creativity	Relationships	Community engagement	Communication	Embeddedness	Robustness & sustainability	Facilitative leadership	Monitoring and Evaluation	Anthropometric outcomes				Intermediate outcomes			
											BMI	BMI-z	Prevalence of children rated as overweight/obese	Other	Nutrition	Physical activity	Other	
<b>EPODE</b> (longitudinal epidemiological study)		●	●	○	○			●		●								
<b>Healthy Living, Cambridge Kids</b> USA (BA)		●	●	○	●		○	○					Within groups change pre/post: ↑↑	Within groups change pre/post: <sup>a</sup> ↑↑			Within groups change pre/post: No. of fitness tests passed: ↑↑	Pre/post change: % of children passing 5 fitness tests/endurance cardiovascular test: ↑↑
<b>Steps to a Healthier Yuma County</b> USA (BA)		●	○	○	●			○								Within groups change pre/post: Best practices by childcare centre: ↑↑	Within groups change pre/post: Best practices by childcare centre: ↑↑	
<b>FLVS</b> France (repeated cross-sectional survey)		○	○					○		○		Within groups change pre/post: ↑↑		Within groups change pre/post: Males: ↑ Females: ↑↑	Within groups change pre/post: weight in kg Males: ↑ Females: ↑↑			
<b>APPLE</b> New Zealand (nRCT)			○		○								Between groups change pre/post: ↑↑	Between groups change pre/post: ↓				

<sup>a</sup> results only for obese, not for overweight

Key:

↑

↓

Comm.

●

BA

cBA

favoured the intervention – no significance (or no significance reported)

did not favour the intervention – no significance (or not reported)

- community

- means of attaining programme element explicitly described, or clearly stated as a goal

- before and after study

- controlled Before & After study

↑↑

favoured the intervention – significant

PH policy- local Public Health policy

○ - programme element mentioned, but means of attaining not described

nRCT - non Randomised Controlled Trial

### **6.3. Overview of programme characteristics**

#### **6.3.1. Obesity prevention**

None of the community-wide obesity prevention interventions were based in the United Kingdom; they were instead based either in the USA and Canada (Shape Up Somerville, Healthy Living, Cambridge Kids; Steps to a Healthier Yuma County); France (FLVS; EPODE), New Zealand (APPLE) or Australia (Romp & Chomp, Be Active, Eat Well).

All of the obesity prevention interventions targeted children below 14 years old. The lower age groups were targeted by Romp & Chomp, aimed towards children aged 0-5 years and their families in the Greater Geelong area, Victoria (Australia), and Steps to a Healthier Yuma County targeting kindergarten-age children attending child care centres in Yuma County, Arizona (USA). Mid to higher age groups were targeted in 5 programmes: one programme aimed at children aged between 4 and 12 years old attending school and preschool in Colac, Victoria, Australia (Be Active, Eat Well), one programme aimed at children aged between five and fourteen years old attending school and preschool in Cambridge, Massachusetts, USA (Healthy Living, Cambridge Kids), one programme aimed at children aged between four and twelve years old attending school and preschool in one of eight pilot towns in France (EPODE) one programme aimed at children aged between five and twelve years old attending school and preschool in Fleurbaix or Laventie in France (FLVS) and one programme aimed at children aged between five and twelve years old attending school and preschool in Ontago, New Zealand (APPLE).

All interventions stated an aim to influence the wider community through the programme, including parents, child care centre workers, teachers and other members of the community. The community-based Shape Up, Somerville programme in Massachusetts (USA) targeted children attending elementary school, aged six to nine years using a participatory approach based on collaborative partnerships with the communities.

Correspondingly, the programme activities and strategies were predominantly school-focussed. However, to be included in this review the community-wide programmes

**Preventing Obesity: the effectiveness of a whole system approach**

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had to exhibit some broader out of school actions and policy changes (see following sections).

Within most programmes, the duration of the intervention differed from the duration of the evaluation carried out (see Table 5). Interventions were delivered by a mix of teachers, care centre workers, community members and researchers, with a number of organisations involved ranging from local university departments, local and regional government education, health, child care, dental health and human services departments, kindergarten associations, leisure associations, private health care providers, local neighbourhood renewal agencies, schools, local gardening organisations, local 'Green Streets' initiatives and farmers' markets collectives.

## Preventing Obesity: the effectiveness of a whole system approach

**Table 5. Programme outcome data collection points**

Programme Country	Programme dates	First data point	Other data points	Duration of intervention	Duration of evaluation	Note on 'baseline'	Note on 'post-intervention'
<b>Romp &amp; Chomp</b> Australia	2004-2008 (and onwards)	2004	2007	4 years	3 years	Yes, data collected at baseline	Data collected a year before 'post-intervention'
<b>Be Active Eat Well</b> Australia	2002-onwards (no end date)	2003	2006	Ongoing (aims for sustainability)	3 years	No, data collected a year after the start of intervention	Not clear (i.e. not clear what would comprise 'post-intervention')
<b>Shape Up, Somerville</b> USA	2002-2005 (although 1 <sup>st</sup> year was planning only)	2003	2004	2 years	1 year	Yes, data collected at baseline (following planning year)	Only interim data, collected at the half-way point of the two intervention years
<b>EPODE</b> France	2004	2005	2009	Ongoing	4 years	Yes, data collected at baseline	Not clear (i.e. not clear what would comprise 'post-intervention')
<b>Healthy Living, Cambridge Kids</b> USA	2005-2007	2003/4	2006/7	3 years	3 years	Yes, prior to start of intervention	Data collected in last year of intervention
<b>Steps to a Healthy Yuma County</b> USA	2005-2008 (but 9 months planning only)	9 months		3 years	9 months	Yes, prior to start of intervention	Data collected in last year of intervention
<b>FLVS</b> France	1992-1997 1997-2002 2002-2007	1992	2000, 2003, 2004	17 years, without stated end point	12 years	Yes, data collected in 1992	Data collected in 2004 (not post-intervention)
<b>APPLE</b> New Zealand	2003-2005	2003	2004; 2005	2 years	2 years	Yes, data collected at baseline	Not clear
<b>COMMIT</b> USA	1988-1993	1988	1993; 2001	5 years	15 years	Yes, data collected at baseline	Data collected post-intervention (and also at a follow-up in 2001)
<b>Breathing Space</b> UK	1998-2000	1999	2001/2002	Approx. 2 years	Approx. 2 years	No, data collected a year after the start of intervention	Data collected in last year of intervention



**Preventing Obesity: the effectiveness of a whole system approach**

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**Romp & Chomp (Australia)**

The Romp & Chomp intervention was part of a wider demonstration programme titled “The Sentinel Site for Obesity Prevention”, based in Victoria, Australia and using ‘action research and community-based interventions’, with a theoretical underpinning based on the Determinants of Health model, the Social Ecological Model and Social Marketing Theory (p.329, Bell et al. 2008). This wider programme, supported by the Sentinel Site team based at Deakin University, also incorporated ‘Be Active, Eat Well’ (see below) and a number of other interventions such as ‘It’s Your Move!’ and ‘Kids – Go For Your Life!’ – although these latter interventions did not report evaluation data which fell within this review’s inclusion criteria.

Romp & Chomp was a ‘whole of community’ obesity prevention intervention that was aimed at preschool children under the age of 5 years old and their families living in the City of Greater Geelong (CoGG) and the Borough of Queenscliffe (BoQ), Australia. The programme ran for four years from 2004 to 2008 with immediate follow-up at post-intervention, and was designed, planned and implemented in partnership between a number of agencies, including the Department of Human Services (from the Victoria State health department), Barwon Health (the largest regional health service provider in the Victoria-Dental and Allied Health Units), CoGG (local government managers of a range of children’s care and health services), Geelong Kindergarten Association (a cluster manager for 33 community-based preschools in the Geelong region), Leisure Networks Association (regional sporting coordinating body), Bellarine Community Health (a health service provider), Dental Health Services Victoria (the state’s public oral health promotion and dental service provider), and the Department of Education and Early Childhood Development (state government department). The overall aim of the programme was to increase the capacity of the local community to promote healthy weight and healthy eating activities in children under the age of 5 years old. Linkages were made at a later point in the programme with two additional interventions – ‘Kids – Go for Your Life’ and ‘Smiles4Miles’, which were concerned with increasing physical activity and oral health and were already running in the intervention area. No further details were given on how these interventions may have influenced the outcomes of Romp & Chomp.

## Preventing Obesity: the effectiveness of a whole system approach

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Community activities included promotional campaigns, integrating simple key messages into policies and practices, increasing access to drinking water, and distributing social marketing materials. In terms of our defined features of a Whole System Approach, the authors of Romp & Chomp use similar terminology to systems language, referring to a 'whole of community' approach which was "complex and ambitious, involving multiple strategies at multiple stages" (p.2, WHO CC, 2009). Romp & Chomp specifically aimed to build the capacity of CoGG and the Borough of Queenscliffe. Local creativity was encouraged within the programme; for example, a structured Active Play Program developed with input from early-childhood workers and "innovative objectives" were expected from the community. There was the stated aim to build capacity through enhancing partnerships, strategic alliances and community organisational networks, providing evidence for reinforcing relationships. The ANGELO Framework was used to enable communities to specify environmental and policy change targets, engaging the community and allowing for greater feelings of ownership. Formal strategies of Romp & Chomp included the aims to develop a communication plan, to change policy and to ensure the sustainability of changes. Integration of the programme into local government and health-service strategic and public health plans was also used as a way of ensuring sustainability. Evidence of facilitative leadership was present, where community health professionals distributed folders to kindergartens with suggestions on possible applications, and community health workers and allied and dental health professionals were trained to support kindergartens to undertake the intervention activities.

### **Be Active, Eat Well (Australia)**

'Be Active, Eat Well' was a Sentinel Site intervention (see above description of 'Romp & Chomp' for more detail) based in Colac, Victoria, Australia. The aim of the programme was to promote healthy eating and physical activity in children aged 4 – 12 years old, run between 2002 and 2006, although with the stated aim to be sustainable with no end date for completion. Data was collected in 2003/4 and 2006 with follow-up data taken immediately post-intervention from six primary schools and four preschools in the Colac area (Intervention N=997) and a stratified random sample of schools in the wider area (Control N=2687) using a controlled before and after study design in a school, home and community combined setting. The theoretical basis for the Be Active, Eat Well programme followed that of the wider Sentinel Site

## **Preventing Obesity: the effectiveness of a whole system approach**

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intervention, which followed the Determinants of Health model, the Social Ecological Model and Social Marketing Theory.

Regarding defined features of a Whole System Approach, the Be Active Eat Well programme incorporated evidence of a number of key features. Relating to capacity building, the programme project staff provided the leadership, funds, and knowledge to encouraged change (e.g. school canteen changes). The programme also sought to build on the skills of health professionals and other stakeholders. Demonstrating local creativity, the local community was supported to create its own solutions to promoting healthy eating and physical activity in the target population. As part of the capacity building process, the lead agency and funding agency aimed to provide support in building personal and organisational relationships. Engagement with the community involved provision of training (e.g. workshops) and setting up committees (e.g. a local implementation committee). Programme strategies were incorporated into local policies such as the Municipal Early Years Plan (Colac Otway Shire) Integrated Health Promotion Plan (Colac Area Health), and the Municipal Public Health Plan (Colac Otway Shire). Be Active, Eat Well explicitly aimed to develop sustainable health promotion strategies and build leadership through community ownership and operation of the programme.

### **Shape Up, Somerville: Eat Smart, Play Hard (USA)**

The 'Shape Up Somerville' programme aimed to facilitate a collaborative partnership with Somerville's communities in order to bring about multiple environmental changes to prevent weight gain in young children, "using every aspect of the community that touches children and their families" (p.1334) (Economos et al. 2007a). The programme ran for three years, from September 2002 to August 2005 with a one year planning stage and 2 years of intervention and follow-up data taken immediately post-intervention. The study design was a non-randomised controlled trial and was based upon the principles of Community-Based Participatory Research. It mostly included new policies and activities related to before-, during- and after-school activities in the 10 elementary schools in Somerville (over 1,600 children). These included: a healthy breakfast programme; a Walk to School Campaign; professional development of school staff (nutrition and physical activity); a school health office (for anthropometric data collection); an improved school food service; a related SUS classroom curriculum (including a 10 minute daily 'Cool Moves', and a weekly 30-minute nutrition and

**Preventing Obesity: the effectiveness of a whole system approach**

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physical activity lesson); enhanced recess (i.e. equipment and resources for more active breaks between lessons); development of school 'wellness' policy; after-school SUS curriculum; and professional development for programme staff.

In terms of community activities based outside schools there was: parent outreach and education including a newsletter and free/reduced price coupons; 'parent nutrition forums'; 'walking/pedestrian trainings'; a City Employee Wellness Campaign; a Farmers' Market initiative; local physician and staff training; a monthly SUS column in the city's newspaper; and the production and dissemination of a number of resource guides (e.g. physical activity, healthy meetings). Most of these initiatives and policies were developed through an extensive community engagement process and the involvement of community members "in all phases of the research: identifying the problem, designing, implementing and evaluating the intervention" (p.1326) (Economos et al. 2007).

In terms of our defined features of a Whole System Approach, the SUS initiative involved clear processes for community engagement, an evident commitment to embed actions and policies in the longer term (especially through the school wellness policy development), and further evidence of robustness and sustainability (for example in securing external funding to continue many of the SUS programme activities. However, at the same time, the approach of the SUS initiative had no stated theoretical basis and made no mention of using a systems understanding of the causes of obesity to design their programme.

**EPODE (France)**

The EPODE programme began in 2005 with data collection carried out every year between 2005 and 2009, although analysis for effectiveness was only based on data from 2005 and 2009. Evaluation was school-based, aimed at assessing the 'evolution of the prevalence of childhood obesity' in eight pilot towns in France between 2005 and 2009 (EPODE, 2005 3672 /id). This targeted children aged between 4 years and 12 years at 2005 and 2009, although it is unlikely that these were all the same children at each data collection point.

The EPODE methodology is a long-term centrally directed and supported programme to prevent obesity in whole communities which is currently (December 2010)

**Preventing Obesity: the effectiveness of a whole system approach**

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implemented in 226 towns in France. There are also affiliated programmes in Belgium, Spain and Greece. EPODE aims to be “a coordinated, capacity-building approach for communities to implement effective and sustainable strategies to prevent childhood obesity” (EPODE Abstract from Epode European Network). Local project managers are trained by a national coordination team in social marketing and “organisational techniques” so that they can mobilise stakeholders at a local level. The four pillars of the EPODE methodology are stated as: the involvement of political representatives; scientific evaluation and dissemination; methods and social marketing, and; public/private partnership. Unfortunately, details of the specific activities undertaken during 2005 to 2009 in the eight pilot towns were not provided. They involved, however, schools (both in terms of catering and extra-curricular activities), local government, health organisations, health professionals, shop owners and local producers, and the local new media.

**Healthy Living, Cambridge Kids (USA)**

This programme, focussed on child weight and fitness, formed a three-year intervention in Massachusetts, USA running from 2005 to 2007 with follow-up data taken immediately post-intervention, it was aimed towards children aged between 5 (kindergarten) and 11 years old (5<sup>th</sup> grade) within the Cambridge Public Schools (CPS) system. The programme was based theoretically on the Social Ecological Model, and used a wide range of partners including Cambridge Public Schools (CPS), Cambridge Schools Committee, Cambridge City, Institute for Community Health, School Health, Cambridge Public Health Department, Parents of children attending schools, researchers, CitySprouts (gardening organisation), Cambridge Department of Human Service Programs, Cambridge Green Streets Initiative, and Federation of Massachusetts Farmers’ Markets. A collaborative Task Force contained members of the community and was involved in policy and implementation.

There were a number of WSA ‘core features’ (identified by PenTAG) which mapped onto the Healthy Living, Cambridge Kids intervention. Capacity building was evident in the staff assessment training, purchasing of school equipment and professional development for PE teachers and canteen staff. The Task Force, partly consisting of community members, created guidelines and were encouraged to seek future funding. Family feedback was incorporated into individualised fitness reports for children, and the programme used a community-based participatory research approach which

**Preventing Obesity: the effectiveness of a whole system approach**

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aimed to foster collaboration. Implementation strategies aimed to embed the programme by providing policy support for healthy living choices. The study authors report community wide change provided momentum for the “post intervention sustainability of many policies” (p.S51, Chomitz et al, 2010).

**Steps to a Healthier Yuma County (USA)**

The ‘Steps to a Healthier Yuma County’ (SHYC) programme, which ran for approximately 9 months in each child care centre between 2005 to 2008 with follow-up data taken immediately post-intervention, aimed to implement a comprehensive health promotion programme which targeted kindergarten aged children, their parents and child care staff. It covered 30 child care centres in six rural communities in Arizona with a focus on obesity and diabetes prevention, and involved 337 staff and 1,876 children. SHYC was one of a number of pilot programmes under the Arizona Steps programme for focusing health promotion at the social, environmental, organisational and policy levels.

The programme activities centred on a coordinator and a number of workshops for child care centres to raise awareness of the problems of childhood obesity. It also used a self-assessment questionnaire to identify where centres were not using best practice in nutrition and physical activity. On the basis of each centre’s self-assessment, a programme coordinator helped centre staff to develop an action plan to address priority areas. These activities generally involved professional development for staff, education for parents, typically delivered through three workshops (on Healthy Eating for Pre-schoolers; Physical Activity for Pre-schoolers, and; Taking Care of Yourself. After these, later workshops might include “values clarification” in order “to help staff and parents connect the information to their own lives”. The programme was said to involve “many adaptations” – for example, collaboration with the agricultural sector promote understanding of the meaning whole grain, together with demonstration kits and recipes.

In terms of our defined features of a Whole System Approach, the SHYC initiative exhibited a number of activities which involved capacity building (extra training in child care centres, demonstration kits and healthy recipes) local creativity (emergence of school salad bar initiative), and relationship-building. There was no obvious element of community engagement in overall programme design and implementation of

**Preventing Obesity: the effectiveness of a whole system approach**

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strategies for improving diet and increasing physical activity. In relation to the robustness and sustainability of the programme and its achievements, it was claimed that the programme “created a culture of health promotion within the child care setting” but the extent to which the programme aimed to make this goal a sustainable one is not clear. However, the SHYC appeared successful in securing longer term funding to provide direct services, which will be administered through some of the structures set up by the Yuma County programme.

**Fleurbaix-Laventie Ville Santé [FLVS] (France)**

Three phases of intervention were carried out in two towns in northern France between 1992 and 2007. The first phase ran from 1992 to 1997, and involved nutrition education in schools. The second phase ran from 1997 to 2002, and involved continuing the work of the first phase with the addition of community involvement in the programme (which began in 1999). In 2002, the third phase began which involved a continuation of the first two phases in addition to a physical activity and nutritional education activities within both schools and the community.

The initial school-based activities involved an education programme established by the school teachers, who had themselves received extra training in nutrition. The education programme was complemented by practical initiatives, such as changes to school cafeteria menus, cooking classes, visits to farms, and family breakfasts. The more community-based activities in the later years included dietitian-led interventions delivered to community associations and town meetings, new facilities to promote physical activity, walking to school days and other ‘healthy lifestyle’ family activities. In relation to features of systems working there was an explicit focus on robustness and sustainability, capacity building (especially dietitians and disseminating knowledge relating to improving nutrition), and improving communications.

**APPLE (New Zealand)**

The APPLE study (A Pilot Programme for Lifestyle and Exercise) was conducted in the Otago region of New Zealand with the aim of determining whether increasing levels of extra-curricular activity and promoting healthy eating could reduce weight gain in children aged between 5 and 12 years old within the local (“relatively rural”) area.

**Preventing Obesity: the effectiveness of a whole system approach**

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The non-randomised controlled trial design used intervention and control groups in separate schools and geographical areas and was both implemented and evaluated over two years from 2003 to 2005. The main initiative was the provision of community Activity Coordinators who were attached to each intervention school with the primary role to encourage increased activity amongst schoolchildren outside the normal school curriculum. It is unclear to what extent the community was also targeted as there was no explicit mention of how the community was engaged. Data was collected on differences in BMI, height and weight scores and prevalence of overweight pupils between intervention and control groups from baseline to 2-year follow-up.

Regarding WSA features, there was evidence of local creativity being harnessed through a number of community members volunteering their time to teach the children new skills. There was weak evidence for community engagement by the Activity Coordinators in encouraging parents and others within the target community to get involved in the school's extracurricular activities.

**6.3.2. Smoking prevention**

Of the smoking interventions, one was based in the UK (Breathing Space) and one was based in the USA and Canada (COMMIT). Both interventions targeted existing smokers with the COMMIT trial explicitly aimed at smokers aged between 25 and 64 years old living in one of 10 communities in the USA and one community in Canada. The Breathing Space intervention was aimed towards the whole community, including non-smokers, and was specifically targeted towards the community, young people, work places and primary care.

**COMMIT (USA/Canada)**

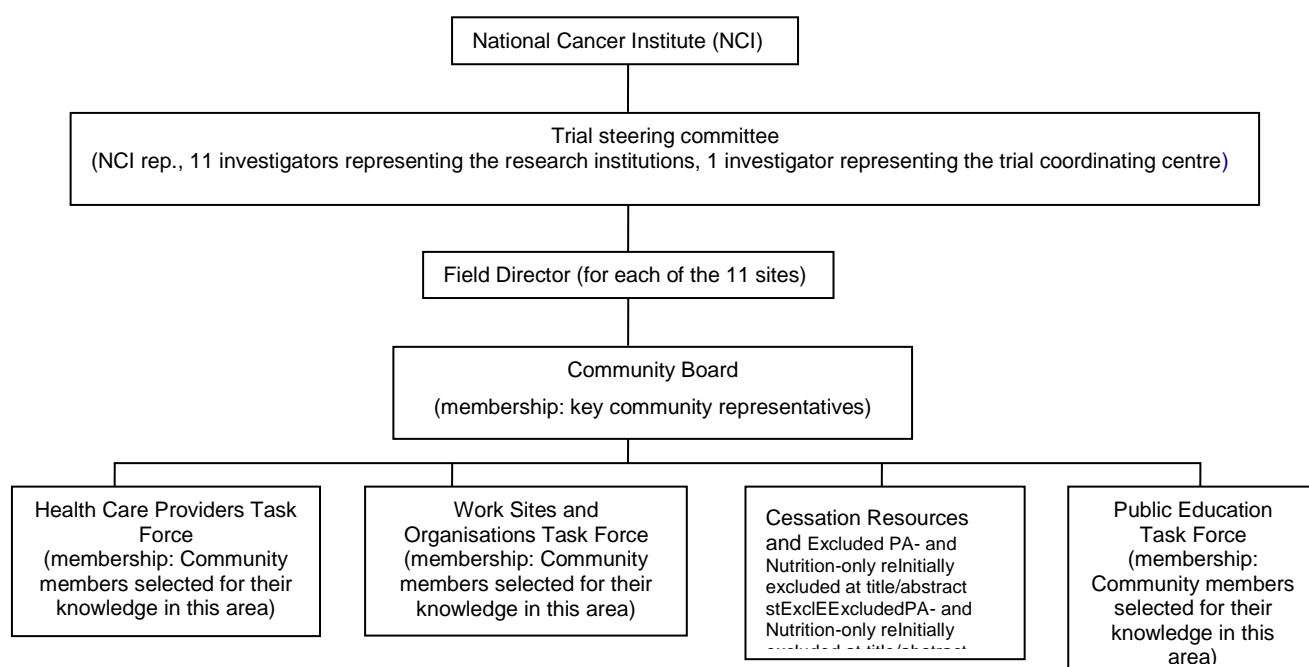
The COMMIT intervention was implemented in a community cohort from 1988 to 1993, with a one-year follow-up survey carried out in 1994 and a two-year follow-up survey carried out in 1995. The programme was aimed at adult smokers, particularly heavy smokers, aged between 25 and 64 resident in one of 20 US and 2 Canadian communities identified as willing to take part in the study and with experience in smoking control and community studies.



## Preventing Obesity: the effectiveness of a whole system approach

Comparison communities within each state were matched for general socio-demographic factors, (population size, ethnicity, percentage female, age, education, mean family income level, mobility/migration patterns, extent of urbanization, number of worksites, estimated smoking prevalence rates, and access to intervention channels (e.g. healthcare, media, cessation services). The trial was structured as shown below in Figure 3, with a Field Director recruited for each of the 11 pairs of communities. Their primary responsibility was to ensure that the intervention protocol is implemented in the local community. The 4 task forces represented the main focus of the intervention, recruited from the local community and selected for their knowledge in a chosen area.

**Figure 3 Structure of the COMMIT intervention**



The National Cancer Institute (NCI) gave 'seed money' to the communities to launch the intervention, with a view to becoming community-driven in future years. Over 4 years of intervention, activities were targeted to healthcare providers, worksites, organisations, schools, media and cessation resources so that community smokers would hear constant and regular messages about smoking cessation.

The trial involved a number of community agencies in each intervention site including the local health department, the local newspapers, health volunteer groups such as the American Cancer Society, the American Heart Association, the American Lung

**Preventing Obesity: the effectiveness of a whole system approach**

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Association, the existing tobacco coalitions, medical societies, hospital(s) health care (other), chamber(s) of commerce, wellness council(s), school superintendent office, substance abuse programme(s), youth agency/group(s), prior COMMIT members and other community spokespeople.

Evidence of a number of WSA 'core features' (identified by the PenTAG team against criteria further developed from PDG1 Review – see Box 1) was identified within the COMMIT trial. System recognition does not feature strongly, but trial-wide goals of COMMIT explicitly refer to redefining the smoking problem as a community issue, aiming to change the community environment and addressing this through increasing both the community capacity to modify smoking and the influence of existing anti-smoking policy and economic factors in order to change the social environment. Community engagement was also implicit throughout the trial – for example, external experts were to be used as facilitators to help direct community change, rather than as specialists imposing knowledge and expertise. Community members were expected to make real contributions with “significant decision-making ability” (p. 191, Thompson et al, 1990), and relationships were discussed in terms of adaptable partnerships, able to adapt and change and recognising the value of norms and differences of individual communities. Embeddedness of action was demonstrated strongly in the emphasis on the involvement and responsibility of members of the community not yet 'concerned' with the smoking problem.

**Breathing Space (UK)**

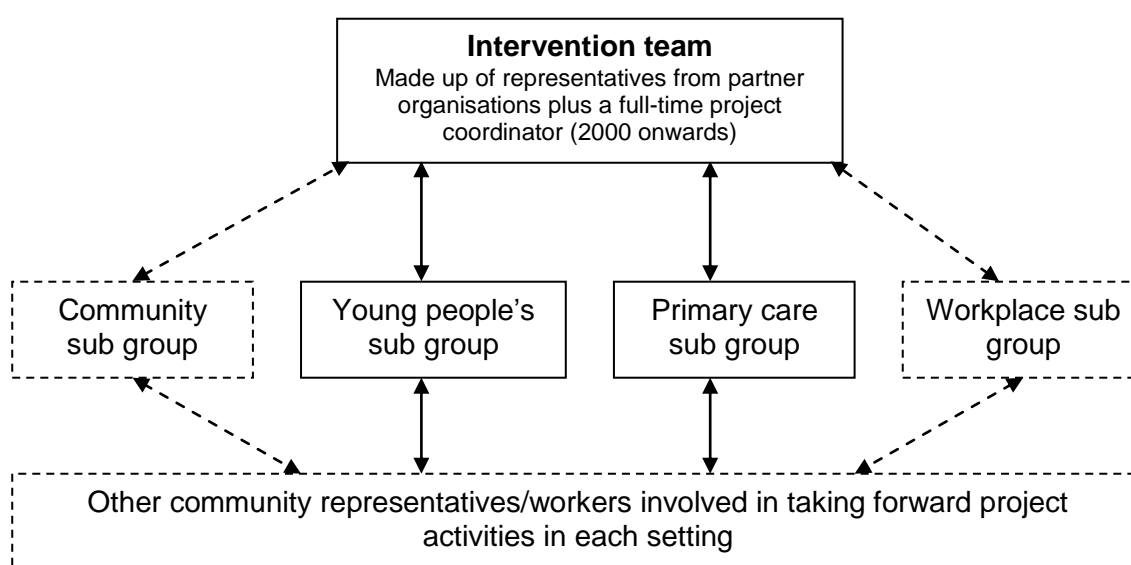
Apart from alliance building across health and urban regeneration agencies the development of activities was achieved by creating 'subgroups' in four target settings: the community, primary care, young people and the workplace (see Figure 4 below). These groups conducted a mapping (audit) exercise to assess needs followed by the development of a draft action plan. Ultimately however, subgroups were only established in the primary care and young people's settings.

In the primary care setting, primary care staff were trained in brief interventions including motivational interviewing. This laid the foundations for practice-based smoking cessation services, together with promotional materials to publicise them. Other proposed initiatives in primary care (such as case notes for identifying smokers) did not get implemented. Using a number of small grants, the activities targeting young people included: the design and

## Preventing Obesity: the effectiveness of a whole system approach

production of anti-smoking posters; the production by young people of a video ('Fag Story') to promote their own messages about smoking; a website project including a competition on the theme of 'What could you do for the price of a packet of cigarettes?', and; the development of a protocol for the provision of smoking cessation support to those under 16 years of age. Some of the promotional materials developed were disseminated through school-based activities (to secondary school first year pupils).

**Figure 4. Structure of the Breathing Space intervention**



----- These parts of the intervention were never fully operationalised

Source: p.9, Platt et al, 2003

In terms of our defined features of a Whole System Approach, the Breathing Space programme exhibited attributes of seven of the nine core features identified in the previous review (see Table 3). Capacity building was evinced through the widespread community training of local staff and community members to assist in interviewing methods, whilst local creativity was encouraged with the creation of a “young people’s remit” (p. 12, Platt et al, 2003) and through promoting the submission of proposals from the community to carry out work for progressing programme objectives through small grant provision. However, it is noted that a number of innovative ideas were not progressed within communities, particularly those aimed at influencing local policy and the environment. The programme aimed to create a ‘bridge’ between the different health promotion settings (see sub groups in Figure 4) and so create an

## Preventing Obesity: the effectiveness of a whole system approach

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embedded community-wide health promoting environment. However, neither the 'community' nor the 'workplace' subgroups were fully formed so this goal was not realised. As the 'community' subgroup was intended to be the "lynchpin...to achieve maximum and ongoing community involvement at all levels" (p. 10, Platt et al, 2003), this method of community engagement and communication - although intended - was not realised. Communication did take place elsewhere, for example during the planning and implementation staged of the intervention with dialogue ongoing between individuals and agencies regarding new smoking cessation initiatives targeted specifically towards primary schools and young people. Focus group interviews showed that community workers felt that, following training, they were "encouraged and empowered" (p.14, Platt et al, 2003) to go out and spread the health message in their own work. Sustainability was built into the programme through the extension of funding for the coordinator post, and there was evidence of continuing programme aspects such as ongoing smoking cessation support from the Wester Hailes Health Agency (WHHA) and new additions such as a young person's pack and the 'Breathe Easy' training packs available to the community.

### 6.4. Overview of study designs

#### 6.4.1. Obesity prevention

Study designs were mixed; there were two Before and After studies (Healthy Living, Cambridge Kids; Steps to a Healthier Yuma County), two Non-Randomised Controlled Trials (Be Active Eat Well; Shape Up, Somerville) and one repeat cross-sectional controlled Before and After study (Romp & Chomp). This meant that even where a common measure was used in a number of studies (e.g. BMI-z) it was often analysed and reported differently – such as pre-/post- change within intervention group, difference in pre-/post- change between groups, or post-intervention only differences between groups.

This variety of study designs was also reflected in the wide range of outcome data reported (see Table 5). Four of the interventions reported BMI scores and BMI z-scores (Romp & Chomp; Be Active Eat Well; Healthy Living, Cambridge Kids; Shape Up, Somerville). Four of the interventions reported on the prevalence of overweight/obesity amongst the target population but of these, two interventions

**Preventing Obesity: the effectiveness of a whole system approach**

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(Romp & Chomp; Be Active Eat Well) used International Obesity Task Force age-specific BMI cut-off points and two interventions (Shape Up, Somerville; Healthy Living Cambridge Kids) used BMI percentiles.

Also, Box 3 describes the study design of the evaluations of these five programmes in more detail.

## Preventing Obesity: the effectiveness of a whole system approach

### Box 3. Summary of each obesity prevention programme's study design

#### **Romp & Chomp (Australia)**

A repeat cross-sectional quasi-experimental design was used, with measures taken from control and intervention groups at post-intervention. Anthropometric data was collected for both intervention and comparison groups at follow-up (2007), and used to determine body mass index (BMI), standardised body mass index (BMI-z) and weight status in children who attended standard state-mandated (MCH KA&S) health check appointments at ages 2 and 3.5 years old.

Intermediate behavioural outcomes of diet and physical activity were collected using parental-reported Eating and Physical Activity Questionnaire (EPAQ) when children attended for their 2 year old or 3.5 year old KA&S health check, before (intervention sample only) and after (both intervention and comparison samples) the intervention. At baseline, 950 children completed EPAQs (intervention only), and at post-intervention 375 children in the intervention group and 786 children in the comparison group completed questionnaires.

Process evaluation data was collected using triangulated mixed methods data collection (document analysis, interviews with key informants, and the Community Capacity Index survey).

#### **Be Active, Eat Well (Australia)**

A non-randomized controlled before and after quasi-experimental design was used, with measures taken pre- and post- intervention in both intervention and control groups. Anthropometric data was collected at baseline (2003/4) and at follow-up (2006), and included weight in kilogrammes and waist circumference in centimetres. This data was used to determine body mass index (BMI), standardised body mass index (BMI-z) and weight status in children who attended standard state-mandated (MCH KA&S) health check appointments at ages 2 and 3.5 years old.

Intermediate behavioural outcomes of diet and physical activity used questionnaires derived from a variety of existing questionnaires including NSW Schools Physical Activity and Nutrition Survey (SPANS) (Booth et al., 2005) collected using Computer-Assisted Telephone Interviews (CATI) for parental reports of physical activity (baseline and in 2006) and collected using Direct Report of Physical Activity for children aged 10-12 years at baseline using a 16 item survey (baseline and in 2006). Satisfaction with body shape and size, also collected using Direct Report of Physical Activity for children aged 10-12 years at baseline using the same 16 item survey as for the physical activity and diet measures (baseline and in 2006).

## Preventing Obesity: the effectiveness of a whole system approach

Process evaluation was planned using document analysis, key informant interviews, participant feedback, focus groups, case studies and surveys (de Silva Sanigorski, 2010). However, comparative evaluation data was not reported.

### **Shape Up Somerville: Eat Smart, Play Hard (USA)**

A non-randomised controlled study design was used measuring between groups change pre- and post-intervention, with baseline measures collected September/October 2003 and post-intervention measures taken in May/June 2004. Anthropometric data was collected on height and weight, and BMI-z scores were calculated as recommended by the U.S. Centers for Disease Control and Prevention. Changes in prevalence of overweight/obesity: was categorised in accordance with the Centers for Disease Control guidelines (z score  $\geq 5^{\text{th}}$  and  $< 85^{\text{th}}$  percentile = desirable;  $\geq 85^{\text{th}}$  percentile and  $< 95^{\text{th}}$  percentile = at risk for overweight;  $\geq 95^{\text{th}}$  percentile = overweight).

Intermediate outcomes were based on behavioural data relating to sports and physical activity and television viewing, assessed as part of a 68-item postal questionnaire for parents/caregivers written in the household language (English, Spanish, Portuguese, or Haitian Creole), but these data did not form part of the programme evaluation: only pre-intervention data were presented.

Process evaluation outcome data were not comparative, but were reported in narrative form.

### **EPODE (France)**

A recent abstract of findings from the EPODE European Network, reports before and after data on the prevalence of overweight and obesity in children for eight pilot towns in France. The data were collected as repeat cross-sectional survey data, with anthropometric measurements carried out in schools, in a total sample of 24,752 children in 2005 and 23,617 children in 2009. However, given the age-range of children (age 4 to 12 years) and involvement of virtually the same schools in data collection in 2005 and 2009, many of the same children will have been followed up over the period. Sub-group analyses by area-based social deprivation were conducted.

No intermediate or process evaluation outcomes were reported.

### **Healthy Living, Cambridge Kids (USA)**

A longitudinal, single-group, before and after design was used, with measures of within groups change pre- and post-intervention taken at baseline (2003/4) and following the intervention (2006/7). Anthropometric data was collected which allowed BMI to be calculated from height and weight measurements, collected routinely by CPS teachers and school nurses. BMI scores were not reported in the final analysis. BMI-z scores were also calculated based on Centres for Disease Control and Prevention, CDC growth charts. BMI-z  $\leq -4$  and  $\geq 5$  were excluded from the analysis. The prevalence of

## Preventing Obesity: the effectiveness of a whole system approach

overweight/obesity was also calculated using BMI percentiles based on age and gender (BMI $\geq$ 95th percentile =obese; BMI $\geq$ 85th and <95th percentile =overweight; BMI $\geq$ 5thth and <85th percentile =healthy weight; BMI <5th percentile = underweight).

Intermediate outcomes were sourced from fitness data collected routinely during PE each spring by CPS, comprising five age and gender adjusted fitness tests (listed in the Results section).

No process evaluation outcomes were reported.

### Steps to a Healthier Yuma County (USA)

A before and after study design was used from 2005 to 2008, with data collection at baseline and follow up at an interval of approximately nine months. This was part of a broader state-wide initiative, titled “Steps to a Healthy Arizona”, which began in 2003. The study was aimed at children, their parents and the staff attending 30 participating childcare centres in Yuma County, Arizona but only the results from 17 centres was included due to data collection issues (the data collection tool was changed in some centres part way through the intervention). No anthropometric data was collected.

Intermediate outcomes were reported for within groups change, with data sourced from a self-assessment questionnaire addressing 56 best practices in nutrition and physical activity, designed through community workshops with no mention of piloting or standardisation.

No process evaluation outcomes were reported.

### FLVS (France)

The mainly school-based obesity prevention initiatives in Fleurbaix and Laventie were evaluated by both uncontrolled repeated measures (in 1992, 2000, 2003 and 2004) and a controlled comparison using 2004 data from the two comparison towns, Bois-Grenier and Violaines. In the published evaluation by Romon et al (2008), 633 school children were measured in 2004 in the intervention towns, and 349 in the comparison towns. Data for over 500 children each year was also collected in the intervention towns for 2002 and 2003. The paper reported both before versus after changes in overweight in the two intervention towns, and compared the prevalence of overweight in 2004 between the intervention and control community children (i.e. without baseline data for this measure in the control community).

No intermediate or process evaluation outcomes were reported.

### APPLE (New Zealand)

A non-Randomised Controlled Trial design was used, with the intervention and control groups from different schools and geographical areas. Children aged between 5 and 12 years old



## Preventing Obesity: the effectiveness of a whole system approach

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(n=720) from four intervention and three control schools were measured for height, weight, BMI, waist circumference, blood pressure, diet, and physical activity levels at baseline and at follow up one and two years later.

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### 6.4.2. Smoking prevention

Of the two programmes included, one used a controlled Before and After design, using different groups at the before and after stage (Breathing Space) and one conducted a Randomised Controlled Trial (COMMIT) across the 11 matching pairs of communities.

Neither intervention reported common outcomes. One intervention (Breathing Space) reported outcomes on quit attempts in the past year, behavioural outcomes (e.g. smoking allowed at home, local smoking restrictions ignored) and attitude/knowledge-based outcomes (e.g. readiness to change own smoking behaviour, smoking perceived as a local problem). The other programme (COMMIT) reported outcomes on quit rates by intervention status, state and cohort, quit ratio by age group, changes in smoking prevalence, and a range of behavioural outcomes such as the number of primary care doctors' practices participating in smoking cessation activities, and individual worksite activities by intervention area (i.e. health, worksite, media/public education, cessation resources, youth). See Table 6 on the following page for an overview.

Box 4 describes the study design of the evaluations of each of these programmes in more detail.

Preventing Obesity: the effectiveness of a whole system approach

Table 6 Smoking cessation – overview of smoking and intermediate outcomes featured

Programme name	Measures of smoking		Intermediate outcomes			Data collection time points
	Cessation rates	Other	Behavioural outcomes	Attitudes/knowledge outcomes	Other	
Breathing Space, UK		Quit attempt in past year	Smoking allowed at home Ignoring local smoking restrictions	Stage of change (self): readiness to change own smoking behaviour Stage of change (community): perceived readiness of community to tackle smoking Smoking as a local problem		Baseline 1999, follow-up at approx. 2½ yrs later in 2001/2002
COMMIT, USA	Quit rates	Quit ratio among ages 25 to 64 Changes in cigarette smoking prevalence	Physician practices by study condition Tobacco control activities in physician's office by study condition Endpoint cohort reports of physician intervention efforts by study condition Worksite smoking policies and environment Worksite smoking cessation activities Changes in cigarette smoking behaviour **			

\*\* Total sample sizes are based on the number of participants who were current smokers in the baseline year for a given comparison and resided in the same state or community during the entire period

## Preventing Obesity: the effectiveness of a whole system approach

### Box 4. Summary of each smoking prevention programme's study design

#### COMMIT (USA/Canada)

A randomised matched pairs design was used to identify 22 intervention and comparison sites, and the 7-year programme ran from 1988 to 1995, with the intervention arm running from 1993 to 1994 (1 year follow-up) and from 1993 to 1995 (2 year follow-up). Longitudinal tobacco-use surveys were taken at baseline and endpoint. Smokers were assessed in two cohorts of heavy smokers and moderate/light smokers, and endpoint cohorts were followed up by telephone interview. Baseline (1989) and follow-up (1993) telephone surveys also sampled households to determine prevalence of smoking behaviour. Quit rates by intervention and control groups, as well as by cohort, were recorded by self-report telephone surveys.

Measures of knowledge, attitudes and smoking behaviours were also collected via telephone surveys at the same time points. No process outcomes were recorded.

#### Breathing Space (UK)

A controlled before and after study design was used, with different groups sampled at the before and after stage. The programme was aimed at adult smokers and non-smokers and began in 1998, with survey data collected at baseline (1999) and approximately 2.5 years later at post-intervention (2001/2002). Four communities were sampled, with one (Wester Hailes) forming the intervention and three (Craigmillar, North Edinburgh and South Edinburgh) forming the comparison group. Each sample was selected at random from residents in each area using the Postcode Address File Data, and selected via a Kish grid if more than one adult was in residence. Samples were drawn independently at each wave, and data was collected via a personal interview within each respondent's home. Data was collected on quit attempts made in the past year.

Behavioural outcomes were also collected relating to the individual's readiness to change, the community's readiness to change, attitudes to smoking in the house, the perception of smoking as a serious problem and whether local smoking restrictions were often ignored.

Process evaluation was carried out using a range of qualitative methods such as observation, document analysis, in-depth interviews with programme managers and workers, and focus groups with key youth workers, young people, practice-based smoking cessation counsellors, and workers from local community organisations. Interviews were transcribed and converted for analysis. Individual data was transcribed and converted for analysis using the QSR NUD•IST software programme. Coding was carried out in line with thematic categories identified before and during the analysis of thematic data, and a selection was checked by two separate reviewers. Data from the focus groups was analysed manually.

#### 6.4.3. Study quality

Study quality assessment using a standard checklist allowed an overall judgement of both the internal validity (likelihood of bias) and external validity (relevance to target population). The resulting quality scores for the evaluation of each programme are shown in Table 7 and Table 8 below. All five community-wide obesity prevention programmes were judged to have poor internal validity, and therefore their findings cannot be attributed with confidence to the programmes described. In contrast, the two evaluations of the two community-wide smoking

## Preventing Obesity: the effectiveness of a whole system approach

prevention programmes show that their effectiveness results are more likely to have resulted from the presence of the programmes. Only the COMMIT study/programme was judged to adequately represent the wider range of communities (in this case, in the USA) that might benefit from the programme, being conducted in a sample of 11 pairs of communities in different States which were shown to broadly reflect demographic and social characteristics of the US as a whole.

**Table 7. Intervention effectiveness data quality assessment summary - obesity prevention**

	Romp & Chomp	Be Active, Eat Well	Shaping Up Somerville	EPODE	Healthy Living, Cambridge Kids	Steps to a Healthier Yuma County	FLVS	APPLE
Study results internally valid (i.e. unbiased)?	-	-	-	+	-	-	+	-
Results generalisable to the source population (i.e. externally valid)?	+	+	+	+	+	-	+	+

**Key:**

**++** All or most of the criteria have been fulfilled. Where they have not been fulfilled the study conclusions are thought **very unlikely** to alter.

**+** Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought **unlikely** to alter the study conclusions.

**-** Few or no criteria have been fulfilled. The study conclusions are thought **likely or very likely** to alter.

**Table 8. Intervention effectiveness data quality assessment summary – smoking prevention/cessation**

	Breathing Space	COMMIT
Study results internally valid (i.e. unbiased)?	+	++
Results generalisable to the source population (i.e. externally valid)?	+	++

<sup>a</sup> for cohort analysis

**Key:**

## Preventing Obesity: the effectiveness of a whole system approach

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**++** All or most of the criteria have been fulfilled. Where they have not been fulfilled the study conclusions are thought **very unlikely** to alter.

**+** Some of the criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are thought **unlikely** to alter the study conclusions.

**-** Few or no criteria have been fulfilled. The study conclusions are thought **likely or very likely** to alter.

### 6.5. Study results - obesity

#### 6.5.1. Anthropometric measures

##### 6.5.1.1. Summary of anthropometric outcomes across obesity prevention programmes

The difference in BMI scores between intervention and control groups at post-intervention was measured in only one of the eight obesity prevention programmes (Romp & Chomp), with data from the two year-old age group demonstrating a statistically significant decrease in BMI between the intervention and control groups, but results from the 3 year old age group demonstrating a statistically non-significant decrease in BMI within the intervention group. Post-intervention there was a higher BMI score observed within the two year-old intervention group under the Romp & Chomp programme. However, if account had been taken of differences at baseline, there would have been a positive change. The change between groups in BMI scores pre- and post-intervention was measured in Be Active, Eat Well and whilst the outcome favoured the intervention, this was not statistically significant. FLVS found a statistically significant within groups change favouring the intervention from pre- to post-intervention.

The difference in BMI-z scores was measured between groups at post-intervention in one of the eight programmes (Romp & Chomp), changes between groups pre- to post-intervention was measured in three of the eight obesity prevention programmes (Be Active, Eat Well; Shape Up, Somerville; APPLE), and change within groups pre- to post-intervention was measured in one of the eight obesity prevention programmes (Healthy Living, Cambridge Kids) demonstrating consistent reductions in BMI-z scores

## Preventing Obesity: the effectiveness of a whole system approach

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within intervention groups. All measures which favoured the intervention were statistically non-significant except for one programme (Healthy Living, Cambridge Kids) which reported a statistically-significant within-groups change from pre- to post-intervention ( $p < 0.001$ ).

The difference in the prevalence of overweight/obesity between groups was measured at post-intervention in one of the eight programmes (Romp & Chomp), changes between groups pre- to post-intervention was measured in two of the eight obesity prevention programmes (Be Active, Eat Well; APPLE), change within groups post-intervention was measured in one programme (EPODE) and change within groups pre- to post-intervention was measured in two of the eight obesity prevention programmes (Healthy Living, Cambridge Kids; FLVS). Nearly all results favoured the intervention except in the case of the APPLE study, which found a statistically non-significant increase in the prevalence of intervention group children rated as overweight/obese from pre- to post-intervention. One programme (Healthy Living, Cambridge Kids) reported statistically significant ( $p < 0.001$ ) changes in prevalence favouring the intervention from pre- to post-intervention, and one programme (FLVS) reported a statistically significant change in prevalence (although the level of significance was not reported) within groups from pre- to post-intervention.

In four programmes (Romp & Chomp, Be Active, Eat Well; FLVS; EPODE), prevalence data was sourced from the International Obesity Task Force (IOTF) age-specific BMI cut-off points (sometimes referred to as the 'Cole classification') and in three other programmes (Shape Up, Somerville; Healthy Living, Cambridge Kids; APPLE) the changes in prevalence were measured using BMI percentiles. Within one programme (Healthy Living, Cambridge Kids) analyses were not provided for this variable.

Differences in waist circumference gain (in centimetres) and body weight gain (in kilograms) between groups from pre-to post-intervention were measured in the Be Active, Eat Well intervention, and a statistically-significant reduction was found both in waist circumference gain ( $p = 0.01$ ) and weight gain ( $p = 0.03$ ), with results favouring the intervention. Within groups weight change from pre- to post-intervention was measured within the FLVS intervention

**6.5.1.2. Anthropometric outcomes by programme****Romp & Chomp**

**BMI scores** from the two year-old and 3.5 year old age group assessed by GLM regression analysis (adjusting for age, sex and height) demonstrated a significant between-group difference at baseline (coefficient<sup>2</sup>=0.18, 95% CI=0.12 to 0.24; p<0.001) and at post-intervention (coefficient<sup>2</sup>=0.15, 95% CI=0.09 to 0.21; p<0.01). Children were heavier in the intervention group. The GLM regression analysis of BMI data from the 3.5 year-old age group (adjusting for age, sex and height) demonstrated a significant between-group difference at baseline (coefficient<sup>2</sup>=0.11, 95% CI=0.01 to 0.21; p<0.05) but not at post-intervention (coefficient<sup>2</sup>=-0.001, 95% CI=-0.09 to 0.01), demonstrating that the intervention children were no longer heavier than comparison sample.

The Romp & Chomp programme reported **BMI-z** data (calculated according to the Centers for Disease Control and Prevention 2000 reference charts) by age group. In the 2 year old age group, GLM regression analysis (adjusted for age, sex and height) demonstrated a significant between-group difference at baseline (coefficient<sup>2</sup>=0.17, 95% CI = 0.11 to 0.22; p<0.001) and at post-intervention (coefficient<sup>2</sup>=0.15, 95% CI = 0.1 to 0.21; p<0.001). Children therefore had a higher BMI-z score in the intervention group. In the 3.5 year old age group, the GLM regression analysis, adjusting for age, sex and height demonstrated a statistically significant between-group difference at baseline (coefficient<sup>2</sup>=0.08, 95% CI=0.02 to 0.15; p<0.001) but not at post-intervention (coefficient<sup>2</sup>=0.01, 95% CI=-0.05 to 0.07). Therefore, children within the intervention group no longer demonstrated a greater BMI-z score than those within the comparison sample.

Data on the **prevalence of overweight/obese children** measured by between-groups difference at post-intervention was reported for both age groups; in 2 year olds, the percentage of the intervention group that were overweight/obese at baseline =17.1±1.0, and 14.6±0.9 at post-intervention, showing a difference of 2.5 percentage points. The percentage of the control group that were overweight/obese at baseline =13.2±0.3, 12.5±0.2 at post-intervention, showing a difference of 0.7 percentage points. GLM regression analysis, adjusting for age, sex and height demonstrated a significant between-group difference at baseline (coefficient<sup>2</sup>=0.29, 95%CI=0.17 to 0.42; p<0.001) and at post-intervention (coefficient<sup>2</sup>=0.16, 95%CI=0.03 to 0.30;

## Preventing Obesity: the effectiveness of a whole system approach

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$p < 0.001$ ). In 3 year olds, the percentage of the intervention group that were overweight/obese at baseline =  $18.6 \pm 1.2$ , and =  $15.2 \pm 1.1$  at post-intervention, demonstrating a difference of 3.4 percentage points. The percentage of the control group that were overweight/obese at baseline =  $16.4 \pm 0.3$ ,  $15.7 \pm 0.3$  at post-intervention, with a difference of 0.7 percentage points. GLM regression analysis, adjusting for age, sex and height demonstrated a significant between-group difference at baseline (coefficient<sup>2</sup> = 0.13, 95% CI = 0.06 to 0.07;  $p < 0.05$ ) [*sic.* – possible error in reporting of CI] but not at post-intervention (coefficient<sup>2</sup> = -0.03, 95% CI = -0.17 to 0.12).

### Be Active, Eat Well

The Be Active, Eat Well programme measured children aged between 4 and 12 years old at baseline and again at follow-up. **BMI scores** were analysed via univariate regression analysis, with group (intervention or comparison) entered into the model together with the following covariates: baseline BMI, age at follow-up, height at follow-up, gender, time between measurements, and clustering by school. No significant difference was found in the between groups change pre-/post-intervention (difference in BMI increase = -0.28 (95% CI = -0.7 to 0.15), robust standard error = 0.21,  $p = 0.20$ ). Be Active, Eat Well analysed **BMI-z** scores via univariate regression analysis, with group (intervention or comparison) entered into the model together with the following covariates: baseline BMI-z score, age at follow-up, height at follow-up, gender, time between measurements, and clustering by school, found that the intervention group children demonstrated a smaller increase in BMI-z scores than children in the control group (difference in z score increase = -0.11 (95% CI = -0.21 to -0.01), robust standard error = 0.05,  $p = 0.04$ ). Children's **change in weight** (in kg, measure taken at baseline and in 2006) was measured in light clothing without shoes to the nearest 0.05kg using electronic scales (A&D Personal Precision Scale UC-321). Two measurements were recorded and where there was disagreement between these measures (of  $> 0.1$  kg) a third measure was recorded, with the mean used for analysis. Univariate regression analysis was carried out, with group (intervention or comparison) entered into the model together with the following covariates: baseline weight value, age at follow-up, height at follow-up, gender, time between measurements, and clustering by school. The study reported that children in the intervention group gained less weight than controls (difference in weight gain = -0.92 (95% CI = -1.74 to -0.11), robust standard error = 0.41,  $p = 0.03$ ).



## Preventing Obesity: the effectiveness of a whole system approach

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Between group pre-/post-intervention **change in waist circumference** (in cm, measured at baseline and in 2006) was measured at the level of the umbilicus using a plastic tape measure. Two measurements were recorded and where there was disagreement between these measures (>0.3cm), a third measure was recorded, with the mean used for analysis. Univariate regression analysis was carried out, with group (intervention or comparison) entered into the model together with the following covariates: baseline waist circumference value, age at follow-up, gender, time between measurements, and clustering by school. Results showed that children in the intervention group grew less than controls (difference in waist circumference gain = -3.14 (95% CI = -5.07 to -1.22), robust standard error = 0.96, p=0.01).

In the intervention group, none of the demographic variables (lower maternal education, lower paternal education, lower household income, and lower area level SES) were found to significantly predict change in the above anthropometric measures, but in the comparison group all of the demographic variables significantly predicted BMI increase, BMI z score increase, and weight increase. All demographic variables except household income predicted waist circumference increase.

### Shape Up, Somerville: Eat Smart, Play Hard

For **BMI z-scores**, the study reported both unadjusted results and results adjusted for differences in potential covariates between children in the intervention group (n=385) and two control group communities (n=561 and n=232). The unadjusted results show modest and slightly larger reductions in BMI-z score between groups (pre-/post-intervention change) within the intervention group than in either of the control groups. However, none of these changes were statistically significant (at the p<0.05 level; reviewer calculation).

The adjusted results, which used multiple regression-based methods of analysis (SAS software PROC SURVEYREG command) to make comparisons between children in the intervention group and two control groups, showed statistically significant changes (p=0.001) between intervention and control groups in the magnitude of change in BMI z-score across the dataset between baseline and follow-up.

Using the regression model derived, they also estimated the intervention effect over 8 months on a hypothetical 8 year-old girl and boy starting at the 75<sup>th</sup> percentile BMI z-score. This analysis estimated that the intervention children would experience a

## Preventing Obesity: the effectiveness of a whole system approach

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lower weight gain of almost one pound (=454 grammes) in weight (-0.82lbs for boys and -0.95lbs for girls). These estimates were just over one pound for children at the 85<sup>th</sup> percentile of starting BMI-for-age (and 50<sup>th</sup> percentile for height).

### EPODE

EPODE did not report analyses for **BMI scores** or **BMI-z scores**, but did report analyses for within group difference at post-intervention in **prevalence of overweight/obesity**, calculated using International Obesity Task Force (IOTF) cut off points. Post-intervention levels of obesity and overweight prevalence were reported as 18.83% of the total population ( $n=23617$ ),  $p<0.0001$  compared with 20.57% in 2005 ( $n=24752$ ), although it is unclear from the analysis what statistical tests were used to generate this data.

### Healthy Living, Cambridge Kids

Health Living, Cambridge Kids did not report analyses for changes in **BMI scores**. Change in **BMI-z scores** were reported, based on Centres for Disease Control and Prevention (CDC) growth charts. BMI-z  $\leq -4$  and  $\geq 5$  were excluded from the analysis. A statistically significant within intervention group pre-/post-intervention change was observed in mean unadjusted BMI-z score (baseline mean = 0.67 (SD=1.06), post-intervention mean=0.63 (SD=1.03), Difference=-0.04,  $p<0.001$ ).

Data on the **prevalence of overweight/obesity** in the study population was measured using the following ranges to assess pre- to post-intervention changes by the following BMI percentiles: BMI  $\geq 95^{\text{th}}$  percentile =obese; BMI  $\geq 85^{\text{th}}$  and  $< 95^{\text{th}}$  percentile =overweight; BMI  $\geq 5^{\text{th}}$  and  $< 85^{\text{th}}$  percentile =healthy weight; BMI  $< 5^{\text{th}}$  percentile = underweight. The prevalence of children rated as 'obese' significantly decreased in terms of within intervention group pre- to post-intervention change (baseline 20.2%, post-intervention 18.0%, change =2.2 percentage points,  $p<0.05$ ). The prevalence of children rated as 'overweight' actually increased from pre- to post-intervention within intervention group (baseline 16.8%, post-intervention 17.4%, change =0.6 percentage points,  $p>0.10$ ), and the authors note that this may be due to the number of children previously rated as 'obese' at baseline *losing* weight and so joining the 'overweight' category at follow-up. The prevalence of children rated as 'healthy weight' increased to a statistically significant level from pre- to post-intervention within the intervention group (baseline 61.0%, post-intervention 63.4%, change =2.4 percentage points,  $p<0.05$ ) and the prevalence of 'underweight' children

## Preventing Obesity: the effectiveness of a whole system approach

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did not change within intervention group to a level of statistical significance from pre- to post-intervention at the level of  $p < 0.05$  (baseline 2.1%, post-intervention 1.2%, change = -0.9 percentage points,  $p < 0.10$ ). Pre-post analyses of prevalence data was also provided for gender, race/ethnicity and income level.

### Steps to a Healthier Yuma County

There was no anthropometric data reported.

### FLVS

To analyse between group changes over time, **BMI scores** were log-transformed to normalise distribution, and models were adjusted for age and took repeated observations into account. Adjusted BMI decreased significantly for both males ( $p = 0.001$ ) and females ( $p < 0.0001$ ) from 2002 to 2004. In 2004 BMI was found to be higher to a level of statistical significance in the control towns when compared with the intervention towns for both genders (male  $p = 0.02$ ; female  $p = 0.005$ ). Data on the **prevalence of overweight/obesity** was assessed using the gender- and age-specific BMI cut-offs according to International Obesity Taskforce (6 month categories) to define overweight and obesity. Their model demonstrated a decrease in the prevalence of overweight/obesity from 2000 to 2004 (n=86, 14.3% in 2000; n=68, 13.2% in 2002; n=62, 10.5% in 2003; n=56, 8.8% in 2004) but supporting statistical information from models was not provided by the authors. In 2004 compared to 2002, overweight/obesity showed a statistically significant change for males (OR=0.72; 95% CI: 0.48 to 1.05) but not for females (OR=0.69, 95% CI: 0.52 to 0.93). Children's **change in weight** from pre- to post-intervention used unadjusted models. Weight significantly decreased over time for females but not for males (males: 2002 mean =28.2, SE = 0.4; 2003 mean =27.5, SE=0.4; 2004 mean =27.0, SE = 0.49,  $p = 0.2$ ; Females: 2002 mean =28.2, SE = 8.8; 2003 mean =26.7, SE=7.9; 2004 mean =26.1, SE = 7.8,  $p = 0.008$ ).

### APPLE

APPLE did not report analyses for changes in untransformed **BMI scores**. Changes in **BMI-z scores** between groups pre- and post-intervention was reported with a mean adjusted BMI-z score reportedly significantly lower in the intervention group than in the control group by 0.30 units (95% CI: 0.24 to 0.36), although the level of statistical significance was not reported. Conversely, the change in **prevalence of overweight/obesity** between the intervention and control group pre-and post-intervention was shown not to favour the

## Preventing Obesity: the effectiveness of a whole system approach

intervention and actually to increase in the intervention group by 0.70 units (95% CI: 0.54 to 0.90).

### ***Evidence statement 6: The effectiveness of community-wide obesity prevention programmes: anthropometric outcomes***

#### **Outcomes reported**

There was a wide variety of outcomes reported across the 8 programmes (two BA: [-] USA (Drummond et al. 2009); [+] USA (Chomitz et al. 2010), three nRCT: [+] USA (Economos et al. 2007b); [+] Australia (Bell et al. 2008; Sanigorski et al. 2008); [+] New Zealand (4 sources<sup>\*1</sup>), one cBA [+] Australia (12 sources<sup>\*2</sup>), one longitudinal epidemiological study ([+] France (5 sources<sup>\*3</sup>) and one repeated cross-sectional survey ([+] France: 3 sources<sup>\*4</sup>). Anthropometric outcomes reported were BMI and BMI-z scores, prevalence of children rated as overweight/obese, waist circumference and body weight.

#### **Strength of evidence**

Overall, there is evidence from a number of community-wide programmes that they can have a beneficial effect on reducing BMI scores in children.

There was a statistically significant and favourable change (over 3 years) in both the prevalence of overweight/obese children and the within-group change pre/post intervention in BMI-z scores in one Before and After (BA) study set in the USA [+] (Chomitz et al. 2010). Two studies in France (a longitudinal epidemiological study [+]: 5 sources<sup>\*3</sup>; and a repeated cross-sectional survey design [+]: 3 sources<sup>\*4</sup>) respectively found a statistically significant between-groups difference at post-intervention for prevalence of overweight or obese children, and a statistically significant within-groups change from pre- to post-intervention both in BMI scores and for the prevalence of children rated as overweight or obese within the female group. A favourable change within the male group, but this was not statistically significant. Within the latter programme, a statistically significant pre- post- change was found in weight (kg) for females. In one controlled Before and After (cBA) study set in Australia [+] (12 sources<sup>\*2</sup>), there was a between groups difference post-intervention only in BMI and BMI-z scores within the two year old age group, with results favouring the intervention. However, within the 3.5 year old age group there was a statistically non-significant result which did not favour the intervention for BMI scores. Results for BMI-z scores and prevalence of children rated as obese or overweight favoured the intervention in all age groups, but these results were not statistically significant.

#### **WSA features**

There is no clear evidence of a relationship between features of system working and

## Preventing Obesity: the effectiveness of a whole system approach

programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c;de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

## Preventing Obesity: the effectiveness of a whole system approach

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### 6.5.2. Intermediate measures

#### 6.5.2.1. Summary of intermediate outcomes across obesity prevention programmes

Differences between groups at post-intervention only for nutritional and physical activity outcomes were measured in one of the eight obesity prevention studies (Romp & Chomp). Regarding nutritional outcomes, Romp & Chomp reported a statistically significant reduction in the number of servings of packaged snacks ( $p=0.03$ ), cordial ( $p=0.005$ ) and fruit juice ( $p<0.001$ ) favoured the intervention. Physical activity outcomes measured the number of trips children within the intervention group were taken on by their parent to the playground/park/pool and time spent watching television per day, and results favoured the intervention.

Between groups differences in changes pre-/post-intervention in other outcomes were measured in one of the eight obesity interventions (Be Active, Eat Well). Childrens' reports of unhappiness with their body size and "not feeling good about themselves" were statistically non-significant and favoured the intervention.

Within-groups changes from pre-/post-intervention were reported for nutritional and physical activity outcomes in two of the eight obesity interventions (Healthy Living, Cambridge Kids; Steps to a Healthier Yuma County). Steps to a Healthier Yuma County reported a statistically non-significant increase in the number of nutritional and physical activity best practices adopted within child care centres. Within Healthy Living, Cambridge Kids, although *no p value was given* the authors also reported a statistically significant increase from pre- to post-intervention physical activity outcomes in the number of fitness tests passed by children, in addition to a statistically significant increase in both the percentage of children passing all five fitness tests ( $p<0.001$ ), and in the percentage of children passing the endurance cardiovascular test ( $p<0.001$ ).

**6.5.2.2. Intermediate outcomes by programme****Romp & Chomp**

**Nutrition and physical activity data** were collected using the parent-reported Eating and Physical Activity Questionnaire (EPAQ) when children were given their regular nationally-organised health service check-up at either 2 years old or 3.5 years old. Data was collected before (intervention sample only, baseline N = 950) and after (both intervention, N= 375, and comparison, N= 786, samples) the intervention and between-groups difference at post-treatment was reported.

GLM regression analysis, adjusting for age, sex and maternal education demonstrated no significant between-group difference at post-intervention for the number of times in the last week that the child was taken to playground, park, pool etc. (coefficient<sup>2</sup>=0.05, 95% CI=-0.02 to 0.12). There was a significant between-group difference at post-intervention for time spent watching TV/DVD (min/day) (coefficient<sup>2</sup>=-0.03, 95% CI=-0.04 to -0.02), with lower viewing time in the intervention sample. Activity preferences and time spent playing computer games were assessed, but data were not reported. The mean between-group difference at follow-up between the intervention and comparison sample in the number of minutes of TV and DVD viewing time showed a statistically significant decrease in the intervention sample (coefficient<sup>2</sup>=-0.03, 95% CI= -0.04 to -0.02, p<0.001).

There was no statistically significant difference (at p<0.05) in the between-group difference at post-treatment for the number of servings of vegetables, fruit, chocolate/candy, cakes/muffins/cookies, water, plain milk or flavoured milk the previous day, or for the frequency of fast food consumption. A statistically significant reduction in the number of servings of packaged snacks (coefficient<sup>2</sup> = -0.23, 95%CI = -0.44 to -0.03, p = 0.03), fruit juice (coefficient<sup>2</sup>=-0.52 to 95% CI=-0.79 to -0.25, p<0.001), and cordial (coefficient<sup>2</sup>=-0.43, 95% CI=-0.73 to -0.13, p=0.005) the previous day was found in the intervention group compared to the comparison group at post-intervention, and servings of vegetables per day (as opposed to the previous day) showed a statistically significant increase in the intervention group at post-intervention (coefficient<sup>2</sup>=0.13, 95% CI=0.03 to 0.23, p=0.01).

## Preventing Obesity: the effectiveness of a whole system approach

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### Be Active, Eat Well

**Satisfaction in body shape and size** was assessed using the Direct Report of Physical Activity, designed for children aged 10-12 years old. The intervention did not demonstrate a statistically significant between-group change pre-/post-intervention in the self-reported level of children's 'unhappiness' (rated 'fairly' and 'extremely') with their body size (intervention 6.3-13.4%; comparison 8.2-15.5%; not significant) or the proportion of children not feeling good about themselves (intervention 2.5-9.8% comparison 2.3-4.8%; not significant).

### Shape Up, Somerville: Eat Smart, Play Hard

There was no intermediate outcome data reported by the Shape Up Somerville programme.

### EPODE

There was no intermediate outcome data reported by the EPODE programme.

### Healthy Living, Cambridge Kids

**Fitness data** were collected routinely each spring during Physical Education classes by Cambridge Public Schools (CPS). Data comprised of five age- and gender-adjusted fitness tests: the Endurance cardiovascular test; the abdominal strength test; the flexibility test; the upper body strength test; and the agility test. Each test can be passed (with either an 'attainment' or 'outstanding' grade) or not passed, based on guidelines from the Amateur Athletic Union and the Cooper Institute.

There was a statistically significant within groups increase in the mean number of fitness tests passed from pre- to post- intervention (baseline = 3.7 (SD=1.32), post-intervention = 3.9 (SD=1.27), reported as significant but p value not given). There was also a statistically significant within groups increase in the proportion of children passing all five tests from pre- to post- intervention (Baseline 29.9%, post-intervention 44.5%, change = 14.6 percentage points,  $p < 0.001$ ), and in the proportion of children passing the endurance cardiovascular test from pre- to post- intervention (Baseline 52.6%, post-intervention 66.6%, change = 14.0 percentage points,  $p < 0.001$ ). These changes were irrespective of race/ethnicity or income status.



## Preventing Obesity: the effectiveness of a whole system approach

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### Steps to a Healthier Yuma County

The main outcomes reported in the evaluation of Steps to Healthier Yuma County were the degree of increased adherence to a 54-item **list of best practices for child care centres** (i.e. before vs. after comparison). These best practices spanned both nutrition goals (36 best practices) and physical activity goals (18 best practices). Overall, across the 17 of the 30 centres for which both before and after data were collected, there was a modest within groups pre-/post-intervention increase in the number of different best practices adhered to (by self-report): from a median of 25 to 30 for nutrition practices, and from 10 to 14 of physical activity practices. However, there was also substantial variation between centres in the degree of improved adherence and wide variation in the degree of adherence to different practices.

The most widely adopted improvements in child care centre practices (i.e. practice adhered to in over 6 more centres than before the programme) were for practices at meals and snacks (such as the determining if child is full before removing plate, and determining if child is still hungry before serving second helpings) and menus and food variety (specifically the availability of whole grain foods high in fibre). Conversely, there was little or no change (an increase of 1 or less in number of centres adhering) for: the serving of juice two or more times per day; the serving of fried or pre-fried meats or fish less than once per week; the visible availability of drinking water outside; serving of skimmed (non-fat) milk to children aged two years or older, and; the presence of food on menus from a variety of cultures all of the time.

Although the studies reported some examples of ways in which the programme led to “expanded, unexpected outcomes” (p.165S) outside the child care centres, there were no quantitative outcomes reported which related to individual staff or childrens’ parents (i.e. the other two groups supposedly targeted by the intervention).

### FLVS

There was no intermediate outcome data reported by the FLVS programme.

### APPLE

There was no intermediate outcome data reported by the APPLE programme.

## Preventing Obesity: the effectiveness of a whole system approach

<b><i>Evidence statement 7: The effectiveness of community-wide obesity prevention programmes: intermediate outcomes</i></b>
<b>Outcomes reported</b>
A diverse range of <b>intermediate outcomes</b> were reported in 4 studies (1 cBA study Australia [+]: 12 sources <sup>*2</sup> ; 2 BA studies USA [+]: Chomitz et al. 2010; USA [-]: Drummond et al. 2009; and 1 nRCT Australia [+]: Bell et al. 2008; Sanigorski et al. 2008) so were grouped by nutritional outcomes, physical activity outcomes and other outcomes.
<b>Strength of evidence</b>
Studies reporting <b>Intermediate outcomes</b> showed results favouring the intervention as between groups difference post-intervention only, between groups change pre- to post-intervention and within groups change pre- to post-intervention (1 cBA study Australia [+]: 12 sources <sup>*2</sup> ; 2 BA studies USA [+]:Chomitz et al. 2010; USA [-]:Drummond et al. 2009; and 1 nRCT Australia [+]:Bell et al. 2008; Sanigorski et al. 2008). Within nutritional measures, a between groups difference post-intervention only (over 3 years) was statistically significant in one controlled Before and After (cBA) study set in Australia ([+]: 12 sources <sup>*2</sup> ), where the number of servings each child reported having per day of less healthy foods reduced, and the number of daily servings of vegetables increased. Within another BA study set in the USA ([-]: Drummond et al. 2009) a statistically non-significant increase was observed post-intervention (over 9 months) in the number of nutritional best practices exhibited within childcare centres. Within physical activity measures, pre-/post-intervention change (over 3 years) was statistically significant in one Before and After (BA) study set in the USA ([+]:Chomitz et al. 2010) with a higher percentage of children passing a fitness test post-intervention than pre-intervention. Within another BA study set in the USA ([+]: Chomitz et al. 2010) a statistically non-significant increase was observed post-intervention (over 9 months) in the number of physical activity best practices exhibited within childcare centres. Within other measures, a decrease was reported (over 3 years) in one non-randomised controlled trial (nRCT) set in Australia ([+]: Bell et al. 2008; Sanigorski et al. 2008) in the number of children within the intervention group who reported unhappiness about body size and low self-esteem.
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

## Preventing Obesity: the effectiveness of a whole system approach

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\*<sup>1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

\*<sup>2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c;de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

\*<sup>3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

\*<sup>4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

### 6.5.3. Process measures

#### 6.5.3.1. Summary of process outcomes across obesity prevention programmes

Only one out of the eight obesity prevention studies reported pre-/post-intervention process outcome data (Romp & Chomp), measuring parental awareness of interventions, physical activity, healthy eating, care provider participation, environmental aspects and policy changes. Parental awareness of the Romp & Chomp intervention had increased post-intervention, although only percentage increases were reported (23% in 2006 and 47% in 2008). A statistically significant increase from pre-to post-intervention was shown in the number of Family Day Care services that had a minimum time set for outside play ( $p=0.01$ ) and organised active play ( $p<0.001$ ), as with the number of guidelines provided by childcare centres regarding bringing health food ( $p<0.001$ ). Statistically non-significant reduction were observed in the number of Family Day Care centres which regularly took children to another location for play time, had outdoor space which help climbing equipment and additional outdoor play equipment and had equipment that could be moved by children and care providers.

Healthy eating and care provider participation outcomes reported a number of pre-/post-intervention processes which demonstrated a statistically significant increase from pre-to post-intervention in the number of Family Day Care services which had rules on foods provided to children in care ( $p=0.01$ ), guidelines on bringing health food, healthy food guidelines written, action taken 'always' or 'most of the time' if foods brought do not meet guidelines, care providers eat and drank the same things as the children 'always' or 'most of the time', care providers given information to parents about healthy eating 'once a week or more', cordial never allowed, vegetables promoted 'once a week or more' (all at  $p<0.001$ ). Statistically significant increases were also reported in the number of Family Day Care services in which packaged snacks ( $p=0.004$ ) and soft drinks ( $p=0.003$ ) were never allowed,

## Preventing Obesity: the effectiveness of a whole system approach

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all care providers had participated in nutrition training ( $p < 0.05$ ) and food was offered as a reward ( $p = 0.004$ ). There was also a statistically significant increase ( $p < 0.001$ ) in the number of Family Day Care centres which had become members of the 'Kids – Go For Your Life' programme (a large-scale government-funded health programme based in children's settings). Statistically non-significant increases were observed in all other healthy eating and care provider participation outcome measures, such as care providers sitting with the children while they ate and talking to the children about health foods 'always' or 'most of the time'.

One other intervention (Be Active, Eat Well) reportedly measured changes to environments, physical activity and eating behaviours, as well as changes in community capacity assessed using the capacity building index for key stakeholders. However, these outcome data were not reported.

Six other interventions (Shape Up, Somerville; EPODE; Healthy Living Cambridge Kids; Steps to a Healthier Yuma County; FLVS; APPLE) did not report process outcome data.

### 6.5.3.2. Process outcomes by programme

#### Romp & Chomp

**Parental awareness of the intervention** was assessed using short intercept interviews with parents of preschool children in the intervention arm ( $n = 181$  in 2006;  $n = 123$  in 2008), attending two community festivals in 2006 and 2008. Awareness of Romp & Chomp was 23% in 2006 and 47% in 2008. Kindergartens were the main source of awareness-raising, with parents whose children attended kindergarten being more likely to have been exposed to Romp & Chomp's key messages. At post-intervention parental awareness of key messages had increased (although the comparison/baseline data is not reported in the original study), with 100% of parents aware of the message to increase daily consumption of fruit and vegetables, 98.3% of parents aware of the message to increase daily physical activity, 97.6% aware of the message to increase daily consumption of water, 84.2% aware of the message to cut down on TV and DVD viewing time (i.e., less screen time) and 83.9% of parents aware of the key message for children to clean their teeth often.

A logistic regression analysis of the post-intervention data was carried out investigating the environmental aspects of intervention and comparison Family Day

## Preventing Obesity: the effectiveness of a whole system approach

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Care services in Romp & Chomp. This highlighted the dichotomy between process evaluation of effects relating to policies and those relating to activities. For example, there was a significant post-intervention difference in the number of care providers who participated in training relating to physical activity (OR=2.61, 95% CI 1.60 to 4.25,  $p<0.001$ ) but very little difference in the number of services that had a minimum time set for organised active play (OR=0.45, 95% CI 0.29 to 0.69,  $p<0.01$ ). Regarding healthy eating, there was a significant increase in the number of guidelines provided on bringing in health food (OR=3.06, 95% CI 1.95 to 4.81,  $p<0.001$ ) but no significant change in whether care providers sit with children while they eat “always” or “most of the time” (OR=0.901, 95% CI 0.50 to 1.64,  $p=0.73$ ).

The New South Wales (NSW) Healthy Capacity Building Framework was used to assess the proportion of actions contained in the Romp & Chomp Action Plan scored against each of the NSW Framework domains. Relating to ‘Partnerships’, Romp & Chomp scored 39.6% overall (21/53 Action Plan activities mapped onto the NSW Framework), with the subset of ‘Relationships’ scoring highly (15/21, 71.4%) but with ‘Planning’, ‘Evaluation’, ‘Implementation’ and ‘Sustained Outcomes’ all scoring 0%. Regarding ‘Leadership’ (which contained subsets including ‘Strategic visioning’ and ‘Systems thinking’) Romp & Chomp also failed to score against any of the Framework domains (0%, 0/53). ‘Resource allocation’ (featuring subsets including ‘Human resources’, ‘Financial resources’ and ‘Specialist advice’) scored 22.6% (12/53), ‘Workforce Development’ (incorporating ‘Workforce learning’ and ‘Professional development opportunities’) scored 7.5% (4/53) and ‘Organisational development’ (featuring ‘Strategic directions’, ‘Recognition and reward system’, ‘Quality improvement systems’ and ‘Informal culture’ at 0%, with ‘Organisational structures’ and ‘Management support’ at 31.2% and 37.5% respectively) scored 30.2%. However, without comparison data from other programmes, or detailed reporting of the items ‘failed’, it is difficult to interpret such results.

### Be Active, Eat Well

This study measured changes to environments, physical activity and eating behaviours (using computer assisted telephone interviews (CATI) questions and a school environment audit questionnaire related to healthy eating and physical activity [adapted from Carter and Swinburn, 2004]), but these outcome data were not reported. Between group changes in community capacity were assessed at baseline

**Preventing Obesity: the effectiveness of a whole system approach**

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and follow-up using the capacity building index for key stakeholders, but again, these outcome data were not reported.

**Shape Up, Somerville: Eat Smart, Play Hard**

There was no process evaluation data reported by the Shape Up, Somerville evaluation.

**EPODE**

There was no process evaluation data reported by the EPODE evaluation.

**Healthy Living, Cambridge Kids**

There was no process evaluation data reported by the Healthy Living, Cambridge Kids evaluation.

**Steps to a Healthier Yuma County**

There was no process evaluation data reported by the Steps to a Healthier Yuma County programme.

**FLVS**

There was no process evaluation data reported by the FLVS evaluation.

**APPLE**

There was no process evaluation data reported by the APPLE evaluation.

## Preventing Obesity: the effectiveness of a whole system approach

<b><i>Evidence statement 8: The effectiveness of community-wide obesity prevention programmes: process outcomes</i></b>
<b>Outcomes reported</b>
One programme set in Australia (cBA [+]: 12 sources <sup>*2</sup> ) reported <b>process outcomes</b> consisting of measures of parental awareness of the intervention, policies adopted or continued, and activities adopted or continued.
<b>Strength of evidence</b>
<b>Process outcomes</b> were only evaluated in one study, a controlled Before and After (cBA) set in Australia ([+]:12 sources <sup>*2</sup> ). Pre-/post-intervention change (over 3 years) was statistically significant in policy-related outcomes and activities, with improvements reported post-intervention. Parental awareness also increased from pre- to post-intervention, but statistical significance data were not reported.
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

<sup>\*2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c; de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

## 6.6. Study results – smoking cessation

### 6.6.1. Smoking outcomes

#### 6.6.1.1. Summary of smoking outcomes across smoking cessation/prevention programmes

Both programmes reported smoking outcome data (see Table 9): quit rate, both by individual and by heavy/light-moderate smoker cohort (COMMIT); and number of quit attempts in the past year (Breathing Space).

Within the COMMIT trial, pre-/post-intervention differences in quit rates by smoker cohort showed a statistically significant increase in quit rates within the heavy smoker cohort

**Preventing Obesity: the effectiveness of a whole system approach**

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intervention group ( $p=0.007$ ) and in the light-moderate smoker cohort intervention group ( $p=0.03$ ). There was a statistically non-significant difference in quit rates by individual smoker between the intervention group and the control group, with both groups showing an increase in quit rates and the intervention group demonstrating a slightly higher rate than the control group.

Within the Breathing Space intervention, quit attempts within the previous year (defined as 'trying to quit smoking completely and staying off cigarettes for at least 24 hours') showed a statistically non-significant increase within the intervention group.

Table 9 below summarises cessation and intermediate outcome measures alongside core features exhibited by programme.



Preventing Obesity: the effectiveness of a whole system approach

Table 9. Overview of WSA features exhibited by programme and study results

Programme name; country	System recognition	Capacity building	Local creativity	Relationships	Community engagement	Communication	Embeddedness	Robustness & sustainability	Facilitative leadership	Monitoring & evaluation	Cessation outcomes				Intermediate outcomes			
											Quit rates by individual	Quit rates by cohort: heavy smokers	Quit rates by cohort: light smokers	Quit attempts in the past year	Stage of change (self)	Stage of change (community)	Smoking perceived as a serious problem	Local smoking restrictions often ignored
COMMIT <sup>a</sup> ; USA & Canada (RCT)		•	•	•	•	•	○			○	Between-group difference at post-treatment ↑	Between-group difference at post-treatment ↑↑	Between-group difference at post-treatment ↑↑					
Breathing Space; UK (cBA)		•	•	•	○	•	•	•						Between-group difference at post-treatment ↑	Between-group difference at post-treatment ↑↑	Between-group difference at post-treatment ↑	Between-group difference at post-treatment ↑↑	Between-group difference at post-treatment ↑↑

<sup>a</sup> results only for obese, not for overweight

Key:  
 ↑ favoured the intervention – no significance (or no significance reported)  
 ↓ did not favour the intervention – no significance (or not. reported)  
 Comm. - community  
 • - means of attaining programme element explicitly described, or clearly stated as a goal  
 RCT - Randomised Controlled Trial

↑↑ favoured the intervention – significant

PH policy- local Public Health policy  
 ○ - programme element mentioned, but means of attaining not described  
 cBA - controlled Before & After study

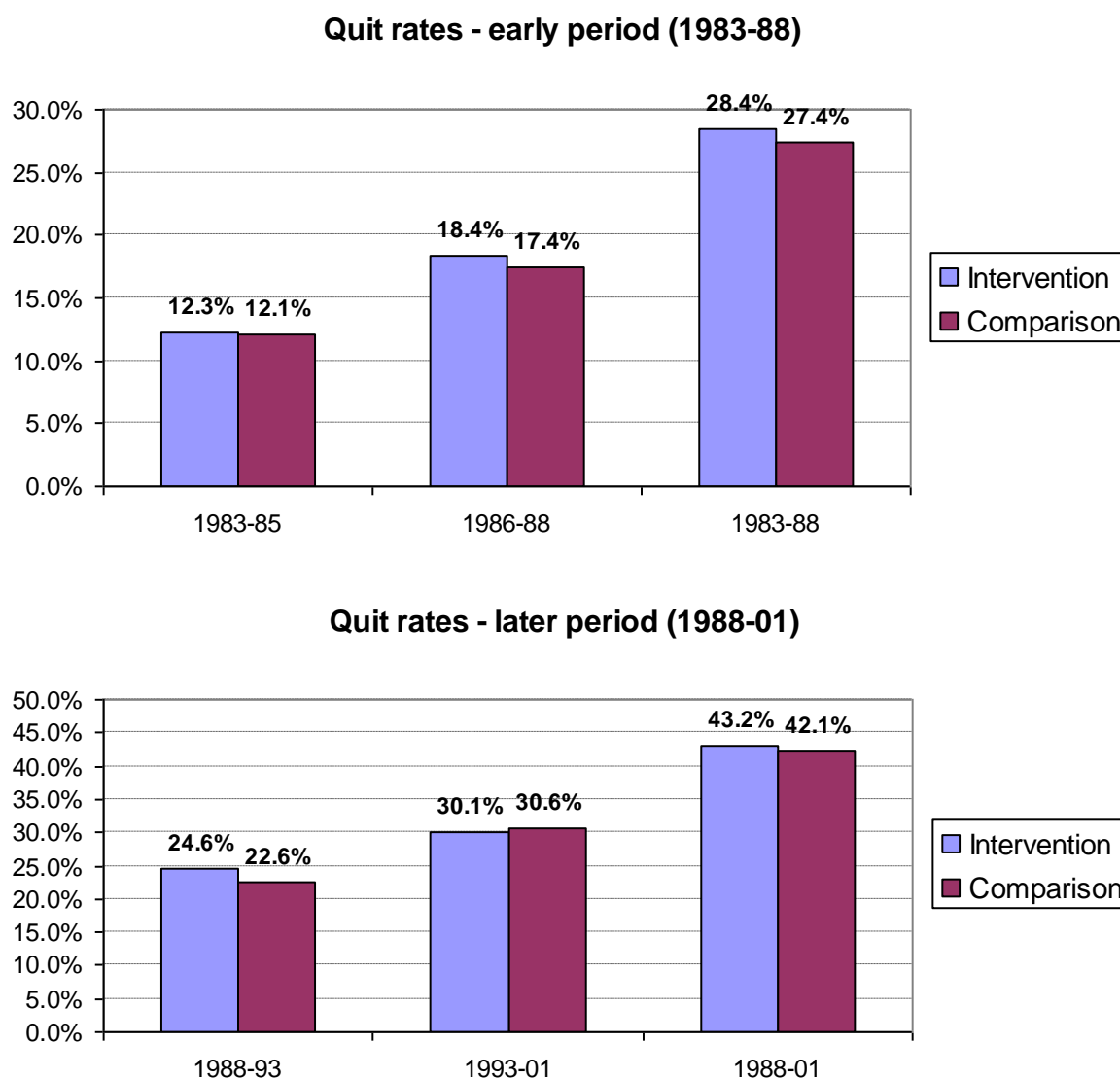
**6.6.1.2. Cessation outcomes by programme****COMMIT**

The primary outcome of the COMMIT study is **quit rates**. These have been reported for both the early years of the programme, and later years, including a period after the programme funding ended (1993-2001), both using repeat cross-sectional survey data. Comparison of quit rates between the 11 intervention communities and their comparison communities indicates that overall the programme achieved modestly higher average quit rates than in the comparison communities (about 1% higher, see Figure 5). However, quit rates were no different than comparison communities 8 years after programme funding stopped (comparison=42.1% quit, N=2316; intervention=43.2% quit, N=2320). Also, improved quit rates were mostly achieved in moderate smokers (<25 cigarettes a day) rather than the heavy smokers who were the originally intended target group.

Quit rates were highest in communities in those states such as California and Massachusetts which had “strong tobacco control policies and aggressive tobacco control programmes”. Conversely, those programmes in states with “little tobacco control activity”, such as Iowa, New Mexico and North Carolina had relatively lower quit rates. Given the ‘matched’ nature of the comparison communities within each state, this provides some evidence that wider state level policies and programmes may provide the necessary context for successful local policies and actions to have an effect. However, *how* this enhanced local effectiveness is achieved, whether by changes in public attitudes or higher levels of available resources at the state level, is hard to discern.

## Preventing Obesity: the effectiveness of a whole system approach

**Figure 5. Quit rates for COMMIT programme sites and comparison areas from 1983-88 and 1988-01**



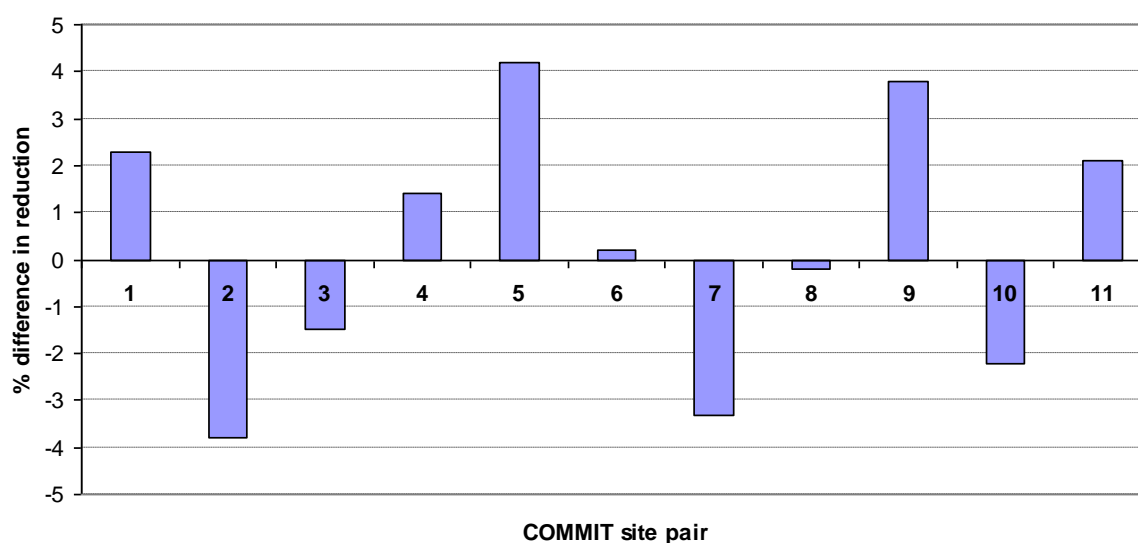
Sources: 1983-88 chart data from Table 2 in: (COMMIT Research Group 1991); 188-01 chart data is from Table 3 in: (Hyland et al. 2006). Note that total sample sizes were based on the number of smokers who were current smokers in the baseline year for a given comparison and resided in the same state or community during the entire period.

The COMMIT study also reported **changes in the prevalence of smoking** and heavy smoking (>25 cigarettes per day) (Lynn et al. 1995). However, there were no statistically significant differences in changes in the prevalence of smoking overall (see). Similarly, there were no statistically significant differences in the **changes in the mean number of cigarettes smoked per person per day**. These results represent the average across all 11 COMMIT sites and their matched comparison

## Preventing Obesity: the effectiveness of a whole system approach

sites. The results varied considerably across the eleven different COMMIT site pairs (Figure 6), but the potential reasons for these wide between state/site variations were not explored in the published paper.

**Figure 6. Differences in the changes in smoking prevalence by COMMIT Intervention-comparison site pairs, 1988-93, those aged 25-64**



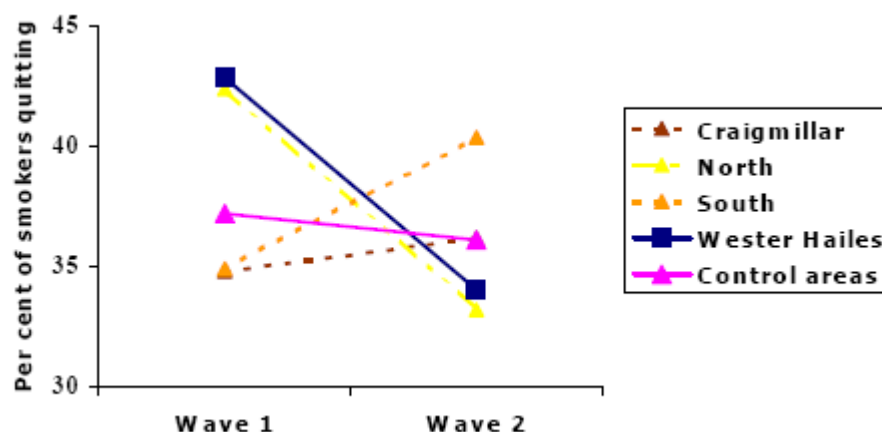
Source: Table 3 of The COMMIT Research Group 1995 (Lynn et al. 1995).

### Breathing Space

The evidence relating to **quit attempts in the past year** is very mixed, with the intervention community exhibiting the highest rate (43% in last year) during study wave 1 compared with those in the three control communities, but the second lowest percentage (34%) who attempted to quit in the last year during study wave 2. In the three control communities there were both decreases and increases in the percentage of people who had attempted to quit (Figure 7).

## Preventing Obesity: the effectiveness of a whole system approach

Figure 7. Quit attempt during past year, by area and study wave



NB. The intervention community was Wester Hailes.

Using both unadjusted comparisons and logistical regression analysis there was no evidence of an intervention effect in the targeted community in relation to quit attempts as an outcome. The results relating to the stated readiness of respondent smokers to change their smoking behaviour was similarly inconclusive.

### 6.6.2. Intermediate outcomes

#### 6.6.2.1. Summary of intermediate outcomes across smoking cessation/prevention programmes

Only one of the two smoking cessation/prevention interventions reported intermediate outcome data (Breathing Space – see Table 9).

Breathing Space reported data on the differences between intervention and control groups relating to readiness of the individual to change their own behaviour (titled 'stages of change (self)'), perceived readiness of the community to tackle smoking (titled 'stages of change (Community)'), rules about where and when smoking is allowed in the home, whether smoking is perceived to be a local problem, how often local smoking restrictions are ignored. There was a statistically non-significant increase within the intervention group reporting readiness of the individual to change their own behaviour. A statistically significant increase within the intervention group was reported in the perceived readiness of the community to tackle smoking ( $p=0.002$ ), whether smoking allowed in the home ( $p=0.024$ ), whether smoking

## Preventing Obesity: the effectiveness of a whole system approach

is perceived to be a local problem ( $p=0.000$ ), and how often local smoking restrictions are ignored ( $p=0.004$ ).

<b>Evidence statement 9: Smoking cessation outcomes</b>
Two programmes reported smoking cessation data consisting of one controlled Before & After (cBA) programme (cBA [+] UK: Platt et al. 2003) and one randomised controlled trial (RCT [++]) USA & Canada: 12 sources <sup>*5</sup> ).
<b>Quit rates</b>
One programme (RCT [++]) USA & Canada: 12 sources <sup>*5</sup> ) reported outcomes on between-group differences in quit rates by individuals (Intervention community quit rate=43.2% (N=2320) Comparison community quit rate=42.1% (N=2316)) and cohort, split into heavy smokers (= smoking $\geq 25$ cigarettes per day) and light/moderate smokers (= smoking $< 25$ cigarettes per day): Intervention community mean quit rate for heavy smoker cohort = 0.18 ( $p=0.007$ ) Intervention community mean quit rate for light/moderate smoker cohort = 0.306 ( $p=0.030$ ).
<b>Quit attempts in the past year</b>
One programme (cBA [+] UK: Platt et al. 2003) reported between groups difference in quit attempts using logistic regression analysis (odds ratio= 0.84; standard error = 0.11, 95% CI = 0.68 to 1.03; $p=0.86$ ).
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.
<b>Applicability to the UK</b>
This evidence is judged to be partially applicable to communities of a similar size within the UK.

<sup>\*5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

### 6.6.2.2. Intermediate outcomes by programme

#### COMMIT

There was no intermediate outcome data reported.

#### Breathing Space

Using both unadjusted comparisons and logistical regression analysis there was no evidence of an intervention effect in the targeted community in relation to process indicators such as:

## Preventing Obesity: the effectiveness of a whole system approach

readiness of the community to tackle smoking behaviour, attitudes to smoking in the house, and; the perception of smoking as a serious local problem. There were similar trends between wave 1 and wave 2 in both the intervention community and the three control communities.

### ***Evidence statement 10: Smoking intermediate outcomes***

One programme (cBA [+] UK: Platt et al. 2003) reported smoking cessation intermediate outcomes consisting of stages of change (self), stages of change (community), smoking never allowed in the house, and local smoking restrictions often ignored.

Using both unadjusted comparisons and logistical regression analysis there was no evidence of an intervention effect in the targeted community in relation to process indicators such as: readiness of the community to tackle smoking behaviour, attitudes to smoking in the house, and; the perception of smoking as a serious local problem. There were similar trends between wave 1 and wave 2 in both the intervention community and the three control communities.

### **WSA features**

There is no clear evidence of a relationship between features of system working and programme effectiveness.

### **Applicability to the UK**

This evidence is judged to be partially applicable to communities of a similar size within the UK.

## 6.6.3. Process outcomes

### 6.6.3.1. Summary of process outcomes across smoking cessation/prevention programmes

Only one of the two smoking cessation/prevention interventions reported process outcome data (COMMIT).

A number of process outcomes were reported within the COMMIT trial, relating to physicians surgeries and work practices, worksite environmental policies and smoking cessation activities, and duration of the effect of the intervention. Within physicians' surgeries, there was a statistically non-significant increase in the number of prevention activities included within the survey which were practiced by physicians within intervention sites. There was a statistically significant increase ( $p < 0.05$ ) in the

## Preventing Obesity: the effectiveness of a whole system approach

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number of intervention site physician practices which were more likely to adopt a number of anti-smoking policies, such as smoke-free offices, displaying anti-tobacco posters and assigning smoking cessation counsellors to patients.

Regarding worksite practices, there was a statistically non-significant *reduction* in the majority of worksite smoking policies and environment practices (such as the worksite having a written or restrictive smoking policy and the mean percentage of worksites reporting employees complying with worksite smoking policies) reported by intervention communities compared to those in control communities. There was a statistically significant difference between worksites within intervention groups that attended a workshop on smoking ( $p=0.02$ ) compared to worksites within control groups. Within cessation activities there was a statistically significant difference with worksites in intervention communities reporting lower scores in the percentage of worksites offering quit-smoking classes and materials ( $p=0.03$ ), offering between-worksite competitions or participating in a community-wide quit smoking contest ( $p=0.06$ ) and participating in the Great American Smokeout/National Non-smoking Week ( $p=0.07$ ).

Durability, which was defined by the study authors as some level of COMMIT-like tobacco control activity existing within the intervention community at follow-up, was investigated in intervention and control sites at 12 to 16 months after the end of the intervention and at 2 years post-intervention. Comparative data was not reported in a number of duration measures, with only intervention group data provided. However, at the 2 year follow up, activities by treatment arm as stated by the 'Expert' subset of respondents (defined as people designated to be most likely to be informed about community tobacco control activities) reported a number of statistically non-significant differences between groups with intervention communities demonstrating higher levels of available smoking cessation information, presence of other community cessation events (not including the Great American Smoke-Out), activities in tobacco control addressing youth, combined youth events and enforcement of regulations against youth smoking.



## Preventing Obesity: the effectiveness of a whole system approach

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### 6.6.3.2. Process outcomes by programme

#### COMMIT

The various published evaluations of the COMMIT programme have also reported outcomes relating to:

- Tobacco control activities of primary care physicians (Ockene et al. 1997)
- Promotion of worksite smoking control policies and actions (Glasgow et al. 1996)
- Durability of tobacco control activities and organizational structures after the end of the trial (Lichtenstein et al. 1996)
- Attitudes towards smoking (Taylor et al. 1998a; Taylor et al. 1998b)

We summarise the methods and results for each of these outcomes in turn below, with a particular focus on data comparing results in intervention and control communities.

**Tobacco control activities of primary care physicians:** A mailed questionnaire survey to primary care physicians in both intervention and control communities (response rate 45% and 42% respectively) retrospectively assessed participation in different levels of training about smoking cessation, and also assessed current reported practices. Of 14 potential smoking prevention current practices there were five practices which were statistically significantly more widely practised ( $p < 0.05$ ) by physicians in the intervention areas than control areas; setting a quit date with smoker patients “most” or “all of the time” (mean percentage of physicians doing this 21.8% vs. 14.4%,  $p = 0.004$ ); giving advice to stop smoking most or all of the time (mean percentage of physicians doing this 98.4% vs. 94.0%,  $p = 0.009$ ); providing self-help materials most or all of the time (mean percentage of physicians doing this 48.2% vs. 42.3%,  $p = 0.048$ ); and participation in tobacco control activity outside the physician’s office (52.6% vs. 26.1%,  $p = 0.001$ ).

A questionnaire to primary care physician offices in intervention ( $n=305$ ) and comparison areas ( $n=302$ ) also surveyed office-level activities. In the intervention area there was a significantly higher ( $p < 0.05$ ) proportion of physician offices in which smoking was banned, and which: had a no smoking sign in the waiting room; had anti-tobacco posters in the waiting room; had self-help guides in the waiting room; had cessation resources guides, and ; distribute literature for the ‘Great American Smokeout’. Finally, an ‘endpoint survey’ in 1993 of over 20,000 members of the public in both intervention and control areas found few differences for smokers in the

## Preventing Obesity: the effectiveness of a whole system approach

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level of stated intervention efforts by their physicians (only a 3% higher level of the reported provision of pamphlets was statistically significant).

**Promotion of worksite smoking control policies and actions:** worksite smoking control strategies and supporting activities were a key aspect of the COMMIT programme. The evaluation of the relevant outcomes was based on (i) a questionnaire sample survey of worksites of different sizes in each of the 22 study communities and (ii) analysis of questionnaire survey responses from the community sample surveys about employees' worksite smoking policies and stop-smoking programmes. Comparing the self-reported smoking cessation activities at the worksites surveyed in intervention communities (mean 110 worksites per community, response rate 88.9%) and in comparison communities (mean 98 worksites per community, response rate 87.5%), interventions worksites were between 2% and 6% more (percentage points) likely to be offering quit-smoking lectures/classes/materials, to be participating in quit-smoking contests (either at worksite or community-level), and participating in the Great American Smokeout during past year (1993;  $p=0.03$ ,  $0.06$  and  $0.07$  respectively). However, in terms of "smoking policies and environments" there were very few statistically significant differences between intervention and comparison worksites (whether based on the worksite survey or the survey of employees within the community surveys); the only significant difference amongst ten policies or practices surveyed was for greater attendance at workshops on smoking in intervention worksites (21.3% vs. 16.1% of worksites per community,  $p=0.02$ ; see Table in data extraction form). (NB. the above results relate to the 1993 survey results (Glasgow et al. 1996), and not the interim results from an earlier smaller survey of COMMIT worksites (Glasgow et al. 1992). However, the latter are described in the data extraction form for COMMIT)

**Durability of tobacco control activities and organizational structures:** two COMMIT studies have assessed the durability of programme activities and organisational structures in the years after the end of the formally conducted and funded intervention (in 1993); one focus group study 12-16 months after (Lichtenstein et al. 1996), and the other a mailed survey two years after the end of the intervention (Thompson et al. 2000). The first, earlier, study that apart from in one community where no COMMIT-related structures still existed, key structures had persisted in most of the 11 former COMMIT sites in terms of: the presence of a coalition or board

## Preventing Obesity: the effectiveness of a whole system approach

(9/11); dedicated funding (9/11); paid staff (10/11) and project area having stayed the same (2) or expanded (8). The presence of selected tobacco control activities was much more variable across sites; in general there were no particular sites that were much more successful at continuing tobacco control activities, and no particular activities being more likely to have continued. However, there is some evidence that school-oriented activities targeting youth smoking were more persistent in intervention areas (all 11 areas reported at least “some” and seven report “much” activity under this category). At two years after the end of COMMIT, while there was evidence that a wide range of tobacco control activities were continuing in the intervention communities, there was no evidence of a lower amount occurring in the comparison communities (except for activities targeting youths).

### Breathing Space

The process evaluation was reported under the headings: leadership and management issues; issues of power and equality; issues of ownership and control; smoking as a community-identified priority; ways of working; interpersonal relationships; resource allocation, and; the wider context and ability/willingness to adapt. However, these were assessed via in-depth interviews and focus group discussions, so they did not yield any quantitative indicators or outcomes for inclusion in this review.

<b><i>Evidence statement 10: Smoking intermediate outcomes</i></b>
One programme (cBA [+] UK: Platt et al. 2003) reported smoking cessation intermediate outcomes consisting of stages of change (self), stages of change (community), smoking never allowed in the house, and local smoking restrictions often ignored.
Using both unadjusted comparisons and logistical regression analysis there was no evidence of an intervention effect in the targeted community in relation to process indicators such as: readiness of the community to tackle smoking behaviour, attitudes to smoking in the house, and; the perception of smoking as a serious local problem. There were similar trends between wave 1 and wave 2 in both the intervention community and the three control communities.
<b>WSA features</b>
There is no clear evidence of a relationship between features of system working and programme effectiveness.

## Preventing Obesity: the effectiveness of a whole system approach

### Applicability to the UK

This evidence is judged to be partially applicable to communities of a similar size within the UK.

### Evidence statement 11: Smoking process outcomes

One programme (RCT [++] USA & Canada: 12 sources \*<sup>5</sup>) reported smoking cessation process outcomes relating to physicians surgeries and work practices, worksite environmental policies and smoking cessation activities, and duration of the effect of the intervention. Within physicians' surgeries, there was a statistically significant increase ( $p < 0.05$ ) in the number of intervention site physician practices which were more likely to adopt a number of anti-smoking policies, such as smoke-free offices, displaying anti-tobacco posters and assigning smoking cessation counsellors to patients.

There was a statistically non-significant *reduction* in the majority of worksite smoking policies and environment practices (such as the worksite having a written or restrictive smoking policy and the mean percentage of worksites reporting employees complying with worksite smoking policies) reported by intervention communities compared to those in control communities. There was a statistically significant difference between intervention worksites that attended a workshop on smoking ( $p = 0.02$ ) compared to control worksites. Within cessation activities there was a statistically significant difference with intervention worksites reporting lower scores in the percentage of worksites offering quit-smoking classes and materials ( $p = 0.03$ ), offering between-worksite competitions or participating in a community-wide quit smoking contest ( $p = 0.06$ ) and participating in the Great American Smokeout/National Nonsmoking Week ( $p = 0.07$ ).

Durability (defined by the study authors as some level of tobacco control activity similar to the intervention existing within the intervention community at follow-up) was investigated in intervention and control sites at 12 to 16 months and 2 years post-intervention. Comparative data was not reported in a number of duration measures, with only intervention group data provided. At the 2 year follow up, activities by treatment arm as stated by the 'Expert' subset of respondents (defined as people designated to be most likely to be informed about community tobacco control activities) reported a number of statistically non-significant differences between groups with intervention communities demonstrating higher levels of available smoking cessation information, presence of other community cessation events, activities in tobacco control addressing youth, combined youth events and enforcement of regulations against youth smoking.

### WSA features

**Preventing Obesity: the effectiveness of a whole system approach**

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There is no clear evidence of a relationship between features of system working and programme effectiveness.
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<b>Applicability to the UK</b>
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This evidence is judged to be partially applicable to communities of a similar size within the UK.
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\*<sup>5</sup> COMMIT sources: COMMIT Research Group 1991; Glasgow et al. 1992; Glasgow et al. 1996; Hyland et al. 2006; Lichtenstein et al. 1996; Lynn et al. 1995a; Lynn et al. 1995b; Ockene et al. 1997; Thompson et al. 2000

### **6.7. Evidence of WSA features in obesity prevention programmes**

Of the ten prevention programmes included in the review, none of the programmes demonstrated evidence of being designed and delivered with explicit recognition of the public health problem as a system. For the eight obesity prevention programmes, of the remaining nine features of systems working six of the included programmes demonstrated clear evidence whilst one programme demonstrated partial evidence of 'capacity building' (see Table 10). Across seven programmes there was some, but less consistent, evidence of 'local creativity' and 'robustness & sustainability'. Five obesity prevention programmes demonstrated some evidence of a focus on developing working relationships. Four of the obesity prevention programmes demonstrated some evidence of a focus on enhancing communication, embeddedness of actions and policies, facilitative leadership and well articulated methods for ongoing monitoring and evaluation of activities.

**Preventing Obesity: the effectiveness of a whole system approach**

**Table 10. Diversity of core features within programmes**

Programmes	Explicit recognition of the public health problem as a system	Capacity building	Local creativity	Relationships	Community Engagement	Communication	Embeddedness of Action	Robustness & Sustainability	Facilitative leadership	Monitoring & evaluation
Romp & Chomp		✓	✓	✓	✓	✓	✓	✓	✓	✓
Be Active, Eat Well		✓	✓	✓	✓	▨	▨	✓	▨	✓
Shape Up, Somerville		✓	✓	■	✓	▨	▨	✓	▨	■
EPODE		✓	✓	▨	▨	■	■	✓	■	✓
Healthy Living, Cambridge Kids		✓	✓	▨	✓	▨	▨	▨	▨	■
Steps to a Healthier Yuma County		✓	▨	▨	✓	▨	■	▨	▨	■
FLVS		▨	▨	■	■	■	■	▨	■	▨
APPLE		■	▨	▨	▨	▨	▨	▨	▨	▨

✓ Means of attaining programme element explicitly described, or clearly stated as a goal  
 ▨ Programme element mentioned, but means of attaining not described  
 ■ Programme element not mentioned

More consistently, for the two smoking prevention programmes there was clear evidence of over five of our defined WSA generic features. Both the COMMIT programme in the USA (and a pair of communities in Canada) and the Breathing Space programme (in Edinburgh) demonstrated that they aimed to involve ‘capacity building’, ‘local creativity’, ‘building relationships’, and ‘improving communications’. Breathing Space also showed clear evidence of ‘embeddedness of policies and actions’ and ‘robustness and sustainability’, while COMMIT had stronger evidence of ‘community engagement’.

## Preventing Obesity: the effectiveness of a whole system approach

<p><b><i>Evidence statement 12: Relationship between system working and effectiveness</i></b></p> <p>Taking into account: the degree of variation across studies; the small sample size of eight programmes; and the range of outcomes reported; it is very difficult to draw conclusions regarding possible relationships between the presence of features of system working, and programme effectiveness.</p>
<p><b>Evidence of 9 out of 10 WSA features</b></p> <p>Only two programmes demonstrated the <b>strongest evidence for system working</b>. One cBA study [+] (12 sources *<sup>2</sup>) set in Australia explicitly describes nine out of the ten features of system working, and demonstrated statistically non-significant between group decreases in anthropometric outcomes. In intermediate outcomes, this programme demonstrated statistically non-significant between-group decreases favouring the intervention in those outcomes relating to physical activity, and statistically significant between-group decreases favouring the intervention in those outcomes relating to nutrition. The other study, an nRCT set in Australia ([+]: Bell et al. 2008; Sanigorski et al. 2008), shows clear evidence of six out of ten WSA features, and makes implicit reference to an additional three features. This study reports statistically non-significant between-group decreases in anthropometric outcomes. No intermediate outcomes are reported, but potential adverse impacts relating to unhappiness about body size and low self-esteem show statistically non-significant decreases within the intervention group.</p>
<p><b>Evidence of 5 to 7 out of 10 WSA features</b></p> <p>One nRCT set in the USA ([+]: Economos et al. 2007b) of the eight included programmes demonstrated weaker evidence for system working in indicating evidence of seven out of ten WSA features. One BA study based in the USA ([+]:Chomitz et al. 2010) explicitly describes three WSA features and makes implicit reference to another three features, and within anthropometric outcomes reported statistically significant pre-/post-intervention change in the prevalence of obese children. This study also reported a statistically non-significant pre-/post-intervention change in the number of fitness tests passed and a statistically significant pre-/post-intervention change in both the percentage of children passing five fitness tests and the percentage of children passing the endurance cardiovascular test. One other BA study based in the USA ([-]: Drummond et al. 2009) explicitly describes only two WSA features and makes implicit reference to another three features. No anthropometric outcomes were reported, but reported a statistically non-significant pre-/post-intervention increase in adherence to best practices by childcare centres (relating to nutrition and physical activity).</p>
<p><b>Evidence of 4 or less out of 10 WSA features</b></p>



## Preventing Obesity: the effectiveness of a whole system approach

One longitudinal epidemiological study based in France ([+]: 5 sources <sup>\*3</sup>) clearly demonstrated evidence of four features, and demonstrated unclear evidence of two additional features. Another, related, repeated cross-sectional survey also based in France ([+]: 3 sources <sup>\*4</sup>) demonstrated unclear evidence of only four features. One nRCT (New Zealand [+]: 4 sources <sup>\*1</sup>) provides unclear evidence of two features. Only the New Zealand study reported a *between group* statistically significant and favourable change in BMI-z scores. The two studies from France showed *pre-/post- reductions* in obesity prevalence, which were statistically significant for all children in one of the studies but only for girls in the other study.

<sup>\*1</sup> APPLE sources: Taylor et al. 2006; Taylor et al.2007; Taylor et al.2008; McAuley et al 2009

<sup>\*2</sup> Romp & Chomp sources: Bell et al. 2008; de Groot et al. 2009; de Groot et al. 2010; de Silva-Sanigorski et al. 2009a; de Silva-Sanigorski et al. 2009c;de Silva-Sanigorski et al. 2009b; de Silva-Sanigorski et al. 2010b; de Silva-Sanigorski et al. 2010a; Nichols et al. 2009; Parker et al. 2009; Parker et al. 2009a; Parker et al. 2009b

<sup>\*3</sup> EPODE sources: EPODE abstract 2010; EPODE results 2010; European Public Health alliance 2010; EPODE Press Kit 2005; Thin Living 2007

<sup>\*4</sup> FLVS sources: Romon et al. 2008; Heude et al 2003; EPODE abstract 2010

## **7. Discussion**

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### **7.1. Summary of main findings**

#### **Effectiveness of obesity prevention programmes in relation to anthropometric outcomes**

Of the eight community-wide multi-strategy obesity prevention programmes included in the review, seven programmes (Romp & Chomp, Be Active Eat Well, Shape Up Somerville, EPODE, Healthy Living Cambridge Kids, FLVS and APPLE) reported anthropometric outcomes such as changes or between-group differences in BMI, weight or waist circumference. Overall, there was no conclusive evidence that such diverse child obesity prevention programmes have either consistent or substantial impacts on levels of obesity/overweight or physical measurements in the short to medium term.

#### **Obesity prevention programme intermediate outcomes**

Four programmes reported intermediate outcomes, ranging from nutrition and physical activity data and fitness data to the number of Physical activity best practices implemented by childcare centre, collected via survey (no standardisation details).

No intermediate outcomes were reported by Shape Up Somerville, EPODE, FLVS or APPLE.

Overall, there was evidence of a positive impact of the included child obesity prevention programmes upon nutritional, physical activity and other measures, with a range of statistically significant and non-significant results favouring the intervention observed.

#### **Obesity prevention programme process outcomes**

One programme looked at parental awareness of the intervention and policy data (Romp & Chomp). None of the other seven programmes (Be Active Eat Well, Shape Up Somerville, EPODE, Healthy Living, Cambridge Kids, Steps to a Healthier Yuma County, FLVS, APPLE) reported comparative obesity-prevention process outcomes.

## **Preventing Obesity: the effectiveness of a whole system approach**

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Pre-/post-intervention change (over 3 years) was found to be statistically significant in policy-related outcomes and activities, with improvements favouring the intervention reported post-intervention. Parental awareness also increased from pre- to post-intervention, but statistical significance data were not reported.

### **Smoking cessation outcomes**

Two programmes reported smoking cessation data consisting of one controlled Before & After study (Breathing Space) and one randomised controlled trial (COMMIT) This programme reported outcomes relating to between-group differences in quit rates by individuals and by cohort, split into heavy smokers (= smoking  $\geq 25$  cigarettes per day) and light/moderate smokers (= smoking  $< 25$  cigarettes per day). The Breathing Space intervention reported outcomes relating to between groups differences in quit attempts within the past year. Both programmes reported a statistically non-significant increase in quit attempts or quit rates favouring the intervention.

### **Comparability of obesity prevention outcomes and smoking cessation/prevention outcomes**

There was little comparative data between obesity prevention outcomes and smoking cessation/prevention outcomes. Smoking programmes were targeted at adults whilst obesity prevention programmes were all focussed on children under 15 years old with a wider element targeting community, adults and/or family. Only one smoking programme was based within the UK, whilst the remaining programmes were based in the USA, Canada and Australia. Length of duration of both the intervention and the evaluation varied widely across all programmes (see Table 5), as did study quality (see Table 7 and Table 8, and Appendix 12). It is therefore not possible to determine robust conclusions about the effectiveness (or otherwise) of adopting a whole system approach from this current evidence, due to the variability in outcomes reported, duration of evaluations and study quality across included programmes.

### **Relationship between whole system features and effectiveness**

Taking into account the degree of variation across studies, the small sample of eight obesity prevention programmes, and the range of outcomes reported, it is very difficult to draw conclusions regarding possible relationships between features of system working and programme effectiveness. The two programmes which

## Preventing Obesity: the effectiveness of a whole system approach

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demonstrated the strongest evidence for system working both took place in Australia but shared few commonalities in terms of design, methods and outcomes measured.

Similarly, because the extent and range of truly community-based activities was generally only briefly described (the activities within most of the obesity programmes appeared to be dominantly school-based and child-focused), it was impossible to investigate possible associations between the 'reach' and/or 'intensity' of the programmes evaluated. As a proxy we have some indication of how many years programmes lasted in a given community and study, but this was typically two years or less.

### 7.2. Potential barriers and facilitators to implementation

A number of potential barriers and facilitators to implementation were identified post-intervention by programme study authors, relating to: population, sampling, data collection, cut-off points, community engagement, resistance to change, tensions between trial integrity and local ownership; funding; and the confounding effects of other initiatives.

Area boundaries were highlighted as both facilitators, enabling the easy partition of populations (Be Active, Eat Well; EPODE; FLVS; APPLE) and barriers, forming population boundaries that were too wide (Romp & Chomp). Community engagement also presented advantages and disadvantages. On one hand, some programmes found engagement with specific groups difficult, encountering problems such as lack of engagement in programme development, budgetary constraints and resistance to change (Romp & Chomp; Shape Up Somerville; Steps to a Healthier Yuma). However, in some situations community engagement became a facilitator in helping to develop collaboration and creativity between community agencies (Romp & Chomp; Shape Up Somerville).

On a greater scale, the issue of partnership and trial integrity was referred to by a number of programmes (Be Active, Eat Well; Romp & Chomp; COMMIT). This refers to the difficulty in balancing true community participation and ownership, against the need to assess an intervention with scientific integrity in order to guarantee there is an appropriate degree of uniformity and consistency between intervention

## Preventing Obesity: the effectiveness of a whole system approach

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communities, whilst not interfering too much with the purpose of the intervention. (p.193 of (Thompson et al. 1990).

Funding was a recurring barrier reported for all programmes, with competing demands, under-resourcing and the desire for quick visible successes often creating tension within programme delivery mechanisms (Be Active, Eat Well; Romp & Chomp; Shape Up, Somerville; Healthy Living, Cambridge Kids; Steps to A Healthier Yuma; COMMIT; Breathing Space).

The EPODE programme only reported effectiveness data on eight towns out of a possible 226 towns included in the programme. This is a missed opportunity in terms of the breadth of evaluation data potentially available, but also raises questions of generaliseability; how far can results be generalised to a wider population when effectiveness data is only available from a relatively small percentage of the overall intervention?

Conversely, the APPLE programme was run in only four intervention schools (N=727) in Otago, New Zealand. This is a small area of intervention and required close scrutiny in order to assess how transferable these results are to a wider area. The APPLE programme also raised questions as to whether it was a truly community-based intervention. All activities described within the effectiveness data were school based and school focused, and whilst there was passing mention of Community Activity Coordinators involving parents and community volunteers in the intervention, and the project was titled a community-based initiative, there was little evidence of wider community activities as part of the intervention.

The two smoking interventions (COMMIT; Breathing Space) specifically mentioned confounding effects of other initiatives; whilst both programmes were in train, a number of other national campaigns overlapped with a number of communities and with the duration of the intervention.

### 7.3. Review strengths and limitations

When reviewing the effectiveness of a “simple intervention” – for example a drug for a well-defined condition within a well-researched disease process - there may be a number of clinical trials with different results which have to be interpreted. This interpretation process

## Preventing Obesity: the effectiveness of a whole system approach

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will often be tractable, because there will be some consistency in the outcome measures reported in these studies, and what variations there are in the nature of the intervention and patient population will typically be limited to a few co-factors such as: the disease severity of patients in the trials; the average dose of drugs taken; and perhaps the duration of treatment (and/or length of follow-up).

Systematic reviews of evaluations in the public health field, of complex multi-component multi-level community-wide interventions have many more potential causes of variations in effectiveness findings. Thus, even where a group of studies have measured outcomes using the same standard measure (e.g. BMI z scores) it is extremely difficult to ascertain whether variations in effectiveness may have arisen due to differences in:

- The specific combination of local actions and local strategies used to try and bring about change
- The characteristics of the population and/or places targeted (including level of social disadvantage)
- The local and national policy context
- Other factors which influence the effectiveness, implementation and sustainability of the relevant actions and strategies

A further aim of this review was to see if there was sufficient good quality evidence, from numbers of studies, to attribute differences in effectiveness not only to **what activities and strategies were implemented** in particular community-wide multi-level obesity prevention programmes, but also **how these changes were designed, developed and implemented**. More specifically, we were interested in seeing if programmes which exhibited more features of a whole system approach (WSA) or which strongly demonstrated particular features of whole system approach appeared more successful.

The main limitation to us being able to do this is the current paucity of evaluated programmes exhibiting very many of our defined features of a WSA (only five obesity prevention programmes, and two smoking prevention programmes). Among these seven programmes which exhibited four or more features of whole system working, there is some variation in the range of features demonstrated. At one end, Romp & Chomp (Australia) was judged to exhibit all WSA features, except that it was not developed around explicit recognition of the systems nature of the causes of obesity. At the other end amongst the community-wide

## Preventing Obesity: the effectiveness of a whole system approach

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obesity prevention programmes, Steps to a Healthier Yuma County only clearly demonstrated capacity building and community engagement as key ways of working, with less evidenced commitments to local creativity, relationship-building and robustness and sustainability. Both of the included community-wide smoking prevention programmes, the COMMIT programme and the Breathing Space programme, exhibited more than five of the WSA features clearly and mentioned some of the other aspects of working.

For anthropometric measures of effectiveness and intermediate outcomes, although most effectiveness results were in the intended directions few were of sufficient magnitude or statistical significance to attribute the findings to the number of or combinations of WSA features. This is mainly a consequence of the few studies found, and that beyond BMI and BMI-z score, the outcome measures used were extremely variable. For example, even among the four studies that reported it, the prevalence of obesity or overweight/obesity was measured using a number of different thresholds. Unsurprisingly, process measures are even less likely to be comparable across studies (hence not shown in the table). If, on top of these differences between study designs, we are to consider the different age groups of children included, the different length of time from baseline to with intervention data collection, and the robustness of the different study designs, it is almost impossible to make reliable inferences.

Lastly, designing searches to identify such a potentially diverse and differently named set of prevention programmes is difficult. Although we based our searches on the previous review (Review 1), included feedback from two sets of information scientists and topic experts (at CPHE and at WMHTAC), and used as many relevant terms as could be identified, there may be other search terms which would have yielded other potentially includable studies.

### 7.3.1. Strengths and limitations of review methods

The strengths of this review are that it has been conducted:

- To address clear review questions
- Using clearly described methods for identifying, selecting and assessing included studies
- According to an agreed (if flexible) protocol
- Accommodating an iterative approach

## Preventing Obesity: the effectiveness of a whole system approach

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### **Limitations: attribution of presence of WSA features**

The inherently qualitative nature of these WSA features, and also the different language and amount of text that authors use to describe the conception, design and development of their programmes and constituent interventions mean that the attribution of the WSA core features to particular community-wide programmes may not be reliable. Certain features or programme aims (like community engagement and capacity building) tended to be more explicitly mentioned or described, and were therefore easier to attribute as a feature of a given programme. Other “more elusive” features – like a focus on the “embeddedness of actions and policies” or “facilitative leadership” were somewhat harder to reliably identify (at least in the kinds of programme descriptions that academic papers allow space for). Therefore, the resultant patterns of features attributed to each programme will be partly a reflection of these factors.

In addition, the late inclusion of an additional tenth feature – “monitoring and evaluation” – necessitated the revision of all included programmes to identify evidence of this additional feature. As understanding of the application and meaning of these WSA features developed and evolved throughout the review process, it should be noted that this method of retrospective allocation bypassed the natural evolution of the process.

### **Limitations: ways of working which are also outcomes**

An unusual aspect of this review is that some of our defined features of a whole system approach can also be viewed as important process outcomes. For example, improved communication between agencies and between agencies and the community is both a goal of the programme (an intended way of working) and potentially also an outcome of interest to the review (if measured). There is an apparent danger, therefore, of arriving at circular self-fulfilling conclusions. However, this overlap between some programme features and outcomes of interest is legitimate because the programme features were primarily judged on the basis of how the programme was intended to be developed and implemented. In contrast process outcomes were reported, regardless of whether they related to an intended feature of the programme.



## Preventing Obesity: the effectiveness of a whole system approach

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### 7.3.2. Strengths and limitations of included studies

The main limitation of the included studies is that there are so few of them that met our review's inclusion criteria. This was only partly to do with the need to focus on studies of programmes which exhibit a number of WSA core features. Following reinstatement of previously-excluded obesity prevention programmes (The APPLE project, New Zealand; EPODE, 8 pilot towns in France; and the FLVS two town predecessor of EPODE). Even within the eight included obesity prevention programmes there was some variation in the degree of clear demonstration of WSA features, with the Romp & Chomp and Be Active Eat Well programmes both demonstrating nine of the ten features of systems working, while the APPLE programme only demonstrated two features.

A clear limitation of the evaluated programmes that were found by this review is their exclusive focus on preventing obesity in children. Although some of the programmes had some actions and policy changes that targeted adults or both adults and children, most strategies for change were school-based, and all of the evaluations only reported anthropometric outcomes for children. While the rationale for preventing obesity in childhood is strong, it is likely that a truly whole system approach would need to address the causes of obesity across those of all ages.

Another limitation of the included studies is their applicability to the UK. Only one of the two smoking prevention programmes and none of the evaluated obesity prevention programmes was in the UK. Although some aspects of policy, society and community organisation are similar between the UK and the USA, New Zealand and Australia, where most of the evaluated programmes took place, there are also many differences in social, behavioural and economic factors that can impact on weight gain (for example in ethnicity, in baseline obesity, in urban design/spatial planning, in diet).

The included programmes had diverse study designs, typically resulting in a high risk of bias in any effects measured. Only one of the studies (the COMMIT smoking prevention trial) used random allocation, and both cohort and repeat cross-sectional outcome data, while all the other studies used non-randomised designs. These variations in overall study design are compounded by substantial variations in both the types of outcome measured, and the specific definition of some outcomes (e.g. the definition of overweight or obesity by two different conventions. Another aspect of

**Preventing Obesity: the effectiveness of a whole system approach**

the variability of study designs is the often short follow-up times (relative to the expected timescale of likely changes) and mixed timing of baseline data collection (see Table 5).

Taking together these various limitations, but especially the few studies that met our inclusion criteria, it is extremely difficult to draw any firm conclusions about the effectiveness (or otherwise) of adopting a whole system approach. Interestingly, a systematic review by Leykum and colleagues has assessed the association of the presence of four characteristics of complex adaptive systems with the effectiveness of interventions to improve outcomes for people with Type II diabetes (Leykum et al. 2007). They concluded that there was an association between the number of complex adaptive system characteristics present in an intervention and intervention effectiveness (see Table 11).

**Table 11. Relationship between outcomes and presence of complex adaptive systems in 32 studies of lifestyle interventions in people with Type 2 diabetes**

Complex adaptive systems (CAS):	No differences	Mixed outcomes	Significant improvement
0 CAS features	●		
1 CAS features	●	●	
2 CAS features	●	● ● ●	
3 CAS features		● ● ● ● ● ● ●	● ● ● ● ● ● ● ● ● ● ● ●
4 CAS features		●	● ● ● ● ● ●

However, Leykum and colleagues had a pool of 32 effectiveness studies in their review, and in order to compare results also had to classify the various process and clinical effectiveness findings of studies according to a simple 3-way typology of whether, overall, they showed ‘no effect’, ‘mixed effect’ or were ‘effective’. Given this and various other limitations they suggest their overall conclusion should be regarded

**Preventing Obesity: the effectiveness of a whole system approach**

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as preliminary. Also, because their systematic review related primarily to individual-focused behaviour change interventions, targeting people with an existing condition, the applicability of their findings to community-wide obesity prevention is doubtful. Nonetheless, as far as we are aware, this is the only other systematic review where an attempt has been made to identify associations between intervention outcomes and the degree to which the interventions have been designed and delivered according to certain design principles or a particular theoretical perspective.

It is possible that a review which intentionally sought out similar prevention programmes, in terms of actions and policies, but programmes which employed systems working approaches to very different degrees, might yield more useful insights. However, finding sufficient numbers of programmes which could be 'matched' in this way would also pose a challenge.

**Preventing obesity using a whole systems approach: the effectiveness of whole system approaches**

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## Preventing obesity using a whole systems approach: the effectiveness of whole system approaches

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**Preventing obesity using a whole systems approach: the effectiveness of whole system approaches**

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