Identifying the key elements and interactions of a whole system approach to obesity prevention

Guidance to tackle obesity at a local level using whole system approaches was initiated by NICE in 2009. The work was put on hold in November 2010 and reviewed as part of the Government's obesity strategy work programme. The revised scope has a stronger focus on local, community-wide best practice. It addresses both process and outcomes.

Before the development of this guidance was put on hold, the Programme Development Group (PDG) for this work met on four occasions and a series of evidence reviews was completed.

This is one of four evidence reviews that were considered by the PDG. The review has been edited to produce a shorter more accessible report for stakeholders.

The PDG is of the view that this review on "identifying the key elements and interactions of a *whole system approach* to obesity prevention" will have resonance in considerations about *community-wide* approaches to obesity prevention. This review includes studies that took a community wide approach to obesity prevention and For example, this review considers issues around capacity building, sustainability, embeddedness and partnerships. However, we would also like to hear stakeholder's views on the work that the PDG has considered to date.

We are particularly interested to hear stakeholder's views on:

1. **The implications of the review findings for current and emerging practice at the community-wide level.**

2. **Whether any evidence has been overlooked, particularly in light of revisions to the scope.**
3. **Whether the features of a whole system approach identified in this review (see pages 13 and 14) also apply to a community wide-approach.**

Please also see the associated call for evidence.

Identifying the key elements and interactions of a whole system approach to obesity prevention

This is an edited version of a systematic review undertaken by the Peninsula Technology Assessment Group (PenTAG) for NICE (final version submitted July 2010). The original report authors were: Ruth Garside, Senior Research Fellow, PenTAG; Mark Pearson, Research Fellow, PenTAG; Harriet Hunt, Associate Research Fellow, PenTAG; Tiffany Moxham, Information Scientist, PenTAG; Rob Anderson, Senior lecturer, PenTAG

This review was edited by analysts at NICE in order to produce a shorter more accessible report for stakeholders. The original unedited version of the report is available on the NICE website.

List of abbreviations

ANGELO	Analysis Grid for Elements Linked to Obesity
ASSIA	Applied Social Sciences Index and Abstracts
BAEW	Be Active, Eat Well
CAS	Complex Adaptive System
CINAHL	Cumulative Index to Nursing and Allied Health Literature
CPHE	Centre for Public Health Excellence (National Institute for Health and Clinical Excellence)
DEFRA	Department for Environment, Food and Rural Affairs (UK)
EPODE	Ensemble, Prévenons L'Obésitié Des Enfants (France)
EPPI	Evidence for Policy and Practice Information
FSA	Food Standards Agency (UK)
GP	General Practitioner
HAZ	Health Action Zone
HC	Healthy Cities
HFA	Health For All
HMIC	Health Management Information Consortium database
INTUTE	Gateway to subject catalogues for study and research
MEDLINE	National Library of Medicine's bibliographic database
NHS	National Health Service
NW	North West (of England)
OPIC	Obesity Prevention in Pacific Communities
PCT	Primary Care Trust
PDG	Programme Development Group
PenTAG	Peninsula Technology Assessment Group
PH	Public Health
PSFPI	Public Sector Food Procurement Initiative
ScHARR	School of Health and Related Research, University of Sheffield
WHO	World Health Organisation
WSA	Whole System Approach

Glossary of terms

Bottom-up	Where activity in a system or organisation is initiated from grassroots rather than imposed from senior levels.
Boundary	Separation between the parts of a system; can be porous to allow flow of information, or impermeable to block transmission
Community based	Centred on or rooted within the community
Complex adaptive system	Theoretical model based on systems theory and drawing on ecological models, where individual elements within a system exist independently but are interdependent on the system in which they operate for preservation and survival. This produces a complex interaction of interdependencies which constantly, and – often unpredictably - evolve as part of the wider system.
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
Cross-level effects	The way individuals/communities effect higher levels (bottom-up), national or regional influences effect lower levels (top-down) or several levels experience interactive effects simultaneously (interactive effects).
Ecological	The relationship of organisms to one another and their physical surroundings
Feedback loop	In a changing system, information about that change is fed back into the system (feedback). With positive feedback loops, this magnifies the effect further, while negative feedback loops further decrease the impact.
Health Action Zones	Launched in the UK in 1997, a national seven-year pilot scheme of 26 zones aimed to improve health outcomes and reduce health inequalities through local working.
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
Obesogenic	Environment or conditions conducive to obesity
Organisation	An organised body of people with a particular purpose, e.g. a business
Partnership working	Operating in a collaborative manner with a range of different associates
Settings	Patterns of behaviour restricted within time and space, either location-bound (e.g. schools) or activity-bound (e.g. sports activities)
Informal/"shadow" networks	Informal set of connections within a system, e.g discussion round the work water-cooler
Synergy	Interaction of two or more agents to produce a combined effect greater than the sum of their separate effects
Tacit knowledge	As opposed to formal knowledge; that which is known informally by individuals or organisations, based on their experience and not present in formal written materials and so less easy to be accessed by others
"Tame" issues	Clearly framed and solvable problems with solutions than can be right or wrong, such as heart surgery
Top-down	Where activity in a system or organisation is initiated from senior levels to the frontline (ie through a hierarchy)
"Wicked" issues	Ostensibly awkward or insoluble problems with no definitive formulation or solution, such as the AIDS epidemic or international drugs trafficking

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1. Summary

1.1. Introduction

This is the first review in a series of work to inform the development of guidance about the prevention of obesity using a whole system approach. The primary purpose of this review was to build a working definition of what is meant by a "whole system approach" to a public health problem, in particular for obesity prevention.

1.2. Aim

The primary aim of the review was to consider:

- What in theory comprises a whole system approach to achieving public health goals?

- According to descriptive accounts of actual initiatives, what in reality comprises a 'whole system approach' to achieving public health goals at a local level:
    - In relation to preventing obesity?
    - In relation to preventing another public health problem (smoking)

The secondary aim of the review was to consider:

- What factors are reported to facilitate or inhibit the success of a whole system approach to obesity prevention at a local level?

1.3. Methods

An iterative search strategy was used to identify potentially includable sources from electronic databases and websites. Reference lists were searched and key authors in the field of whole system approaches contacted in order to identify additional sources.

Source inclusion decisions were made according to a pre-defined checklist. The complexity of the source material meant that these decisions frequently required

discussion between the three reviewers in order to reach a consensus. Greater use was made of sources that had more conceptual depth.

1.4. Key findings

Evidence statement 1: Whole systems theory

Based on Butland, 2007; Hawe et al., 2009; Plamping et al., 1998; Plsek, 2001; Pratt, 2005; and Rowe et al., 2005.

- authors may interpret what is meant by a whole system in different ways; there is a clear division in views between those advocating "complexity theory" and those discussing a more mechanistic approach.
- a whole system approach to achieving change in organisations, communities or individuals shares conceptual underpinnings with complexity science and complex adaptive systems
- systems continually evolve, with complex outcomes arising from a few simple rules of interaction
- self-regulation occurs within systems, and efforts to contain them may be counterproductive
- systems include formal and informal relationships or networks; these relationships are of great importance
- systems can exist in single or multi-sector organisations

Summary statement 2: Implications of whole system theory for ways of working

Based onAttwood et al. 2003; Bauld & Mackenzie 2007; Hawe et al. 2009; Hudson 2004; Plsek 2001; Pratt et al. 2005; Stacey 1996; Senge 1993.

Whole system theory suggests that organisation or community goals may best be achieved by:

- Creating more flexible organisational structures
- Recognising that relationships are crucial
- Understanding how positive and negative feedback loops within a system operate – giving insights into how to increase or sustain positive outcomes

• Genuine engagement and discussion about the issues to be addressed – developing shared meaning and purpose - before moving on to 'problem-solving'. This must include a diverse range of actors and community members at all organisational levels.

• All actors understanding the system in which they operate (and their role within it).

• Awareness of the divisions between traditional ways of working and whole system working. The former may involve hierarchical leadership and complex targets and plans while the approach of the latter may be to increase opportunities for natural adaption.

Summary statement 3: Implications of whole system theory for those working within the system

Based on Pratt et al 2005 and Attwood et al 2003

- Individuals participate in their own capacity rather than as a representative of an organisation, community or profession so that they only agree to do what is in their power.
- Successful and productive communication within or across organisations may require innovative approaches to break down traditional restrictions stemming from hierarchies and differing expectations of organisations, professions and individuals.
- The personal qualities of individuals working within the system maybe important. Personal qualities such as optimism, empathy, humility and tenacity may increase the likelihood of success
- A willingness to take the 'long view' rather than go for the 'quick fix' is essential for a systems approach to be effective (Attwood et al. 2003)

Evidence statement 4: Implications of a whole system approach for evaluation

Based on Attwood et al., 2003; Bauld & Mackenzie 2007; Dooris, 2006; Hawe et al., 2009; Pratt, 2005; Rowe et al., 2005.

- In a whole system approach, it is the *function* rather than the *form* of activities which is standardised.
- The change in behaviour of individuals working within the system, through developing relationships and creating robust networks, is central.

- Evaluating a systems approach is complex. Different techniques for evaluation may be required to assess the added benefit of taking a systems approach. Process outcomes and the robustness of the systems are of particular interest (over and above short term outcomes).
- Evaluation of a systems approach needs to consider the networks that have been established and the relationships and synergies between and within settings.
- Evaluation of a systems approach may be time consuming.

Evidence statement 5: Potential challenges of whole system working

Based on Attwood et al., 2003; Rowe et al., 2005; Stacey, 1996.

- Challenging long-standing assumptions can be uncomfortable
- Traditional organisational structures are culturally embedded and change may appear chaotic

Conclusions

Therefore the features of a systems approach to tackle health problems are:

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 ability 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:** Mechanisms to support 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 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.*

2. Aims and Background

2.1. Objectives and Rationale

The aim of this report is to produce a working definition of a whole system approach to obesity prevention.

2.2. Background

There is broad agreement that causes of obesity are complicated, and exist at multiple levels and in multiple settings. Any action to address obesity must therefore recognise and respond to the many socio-cultural, economic and environmental determinants of health. The Foresight report on obesity suggests that efforts to prevent obesity need to address the complex and interconnected system of influences which cause it (Butland et al.).

The terminology of "a whole system approach" or "whole system working" is increasingly visible in health care literature, particularly in circumstances where causes and solutions to a problem are seen as multiple, interrelated, and operating at many different levels, as is the case for obesity. The Foresight report identified a complex map of interconnecting factors, which it called the obesity systems map, representing an increasingly obesogenic environment which facilitates weight gain (Butland et al.).

However, it is clear that a "systems approach" can carry a range of different meanings for different authors and organisations, so the purpose of this piece of work is to try and develop a provisional working definition.

The term "system" in itself contains many possible definitions, some of which are contradictory, so that they can be variously conceived as naturally occurring or artificially constructed; stable or developing. This has been noted by other authors, describing a system as abstract or concrete; elementary or composite; linear or non-linear; simple or complicated; complex or chaotic (Rickles, Hawe, and Shiell 933-37).

We were also aware that the language of systems could simply be used as new nomenclature for an old idea. The following was noted over a decade ago:

> *Over the years the trumpet has sounded for joint working, interagency working, and multi-sector working; for collaboration and alliance; and most recently "partnerships" – between private and public sectors, professionals and lay people (whether "patients" or "the public"). Although the words have changed over the past 20 years, the rhetoric remains the same. (Popay and Williams 410-11)*

In contrast, others have perceived whole system as "a radical new way of thinking about change in complex situations – a combination of theory and practical methods of working across boundaries" (Pratt, Gordon, and Plamping).

It is important to establish a coherent idea about what the terminology "whole system approach" means, as well as where it perhaps has been wrongly co-opted. It is also important to distinguish between systems concepts being used as explanatory models (such as in the Foresight report on obesity) as opposed to those which use a system approach to address those problems (the focus of this review).

3. Methods

3.1. Review questions

The primary research questions are:

Question 1: What, in theory, comprises a whole system approach to achieving public health goals?

Question 2: According to descriptive accounts of actual initiatives, what in reality comprises a 'whole system approach' to achieving public health goals at a local level:

- In relation to preventing obesity?
- In relation to preventing another public health problem (smoking)

As a secondary aim the following was also considered:

What factors are reported to facilitate or inhibit the success of a whole system approach to obesity prevention at a local level?

3.2. Process for review

An iterative approach was taken. Unlike a typical systematic review of effectiveness, we did not treat all included studies in the same depth. A grid of possible areas of investigation was developed and it was agreed that these would be subject to the results of this emerging definition, the volume of material identified and the informative nature of the material (see table 1).

Table 1 Matrix of potential relevant studies for this review

	In Theory	In practice, Where called "whole system approach" (WSA) or "systems approach"	In practice, Where the initiative exhibits many of the features of a whole system approach
Public Health problems	**1.** Reports/documents describing what a whole system approach (to tackling public health or other social problems) should comprise	**3.** Reports/documents about actual initiatives which claim to have used a WSA to prevent other selected public health problems e.g. smoking cessation/prevention	**5.** Reports/documents about actual initiatives which claim to have used a other-named approaches which exhibit many features of WSA to prevent other public health problems e.g. smoking cessation/prevention
Obesity	**2.** Reports/documents describing what a whole system approach to tackling obesity should comprise	**4.** Reports/documents about actual initiatives which claim to have used a WSA to prevent obesity	**6.** Reports/documents about actual initiatives which have used other-named approaches but which exhibit many features of WSA e.g. described as a "community wide initiative".

We did not identify any papers falling within cell 2, cell 3, or cell 4. Therefore we expanded question 1 to look at a very broad range of health and other public sector examples as long as they demonstrated a whole system approach (cell 1).

To address question 2 we also looked at cell 6, identifying what, in practice, had been done in terms of population/community approaches to obesity prevention. Due to time limitations, we did not pursue reports about other public health problems which were not explicitly referred to as whole system approaches (cell 5).

3.3. Identification of evidence

3.3.1. Searches

A series of iterative searches were undertaken to identify any relevant reports books and papers. For question one, search terms around "systems approach" were used

(an additional search term – “ecologic” proved not to be fruitful). For question 2, search terms around “community” (or “ecological”) and “obesity” were used.

The following databases were searched; ASSIA, CINAHL, MEDLINE, HMIC, EPPI Centre Databases (Bibliomap, DoPHER, TRoPHI, Obesity and Sedentary behaviour studies database, INTUTE, Social Science Citation Index. All bibliographic searches used filters to limit publication years from 1990 to date of search.

Any source obtained as full text was subject to citation searching to identify any additional, relevant papers. We also used the “cited articles” feature to track similar papers and contacted five authors of key texts to ask them to supply relevant references.

A number of potentially useful websites were searched. Where websites were not obesity specific, they were searched using the terms “community” AND “obesity”. Where websites were obesity specific, searches looked for “community”, “systems” and “policy”. Where searches produced lists of material numbering more than 100 items, the first 100 items were assessed for relevance.

3.3.1.1. Inclusion criteria

During the course of this review it became clear that a “whole system” approach in the theoretical literature has a core and conceptually distinct meaning. This meant that, unless the language of systems was consciously used by authors, it was not included in this review to answer question 1. However, this was complicated by the realisation that, even among those definitions which *did* refer to themselves as using a whole system approach or whole system ways of working, some were not clearly describing what we had come to think of as an “authentic” system approach.

In relation to question 2 we continued to include papers which focused on “community-based” schemes for obesity prevention providing they exhibited some of the features that we came to associate with a whole system approach.

3.3.1.2. Screening

Three people, RG, HH, MP, were responsible the initial screening of titles and abstracts, and the detailed screening of requested full text papers, reports and books. The team met every day to discuss what they had read and decisions about including or excluding articles. If there was any doubt, a second person read the article and it was discussed again. These meetings were crucial to the process and the developing concept of a whole system approach. Time limitations precluded formal second reviewer screening of a percentage of these titles and abstracts.

A predefined checklist was used to assess whether or not sources met the inclusion criteria. If the abstract provided insufficient information or if no abstract was available then the full text of the report was obtained.

The screening process was also used to identify review papers that could be used as a source of further includable citations.

3.4. Methods of analysis/synthesis

3.4.1. Source assessment

For question 1, NICE quality appraisal checklists were not considered appropriate for assessing the lengthy, discursive or theoretical texts included in the review (NICE). Therefore, a broad approach - Ritzer's *Meta-theorising in Sociology* (Ritzer) - was used to appraise whether the source provided a coherent account of the concepts used and their relationship to each other. It was not considered appropriate to quality rate the included studies (as poor, acceptable or good) as the review team were considering quality of the sources in terms of what they could contribute to the synthesis.

Papers identified for question 2 were not formally quality assessed. However, for the purposes of this review, a study which enabled the reviewers to extract more information about the approach taken may be deemed to be more useful (or better 'quality').

3.4.2. Information extraction

Information from included sources was extracted into evidence tables developed for each question. Information extraction was not 'checked' in the conventional systematic review sense. Instead, information extraction from all included sources was discussed by the three reviewers (RG, MP, HH) at frequent review team meetings to ensure consistency.

3.4.3. Synthesising information

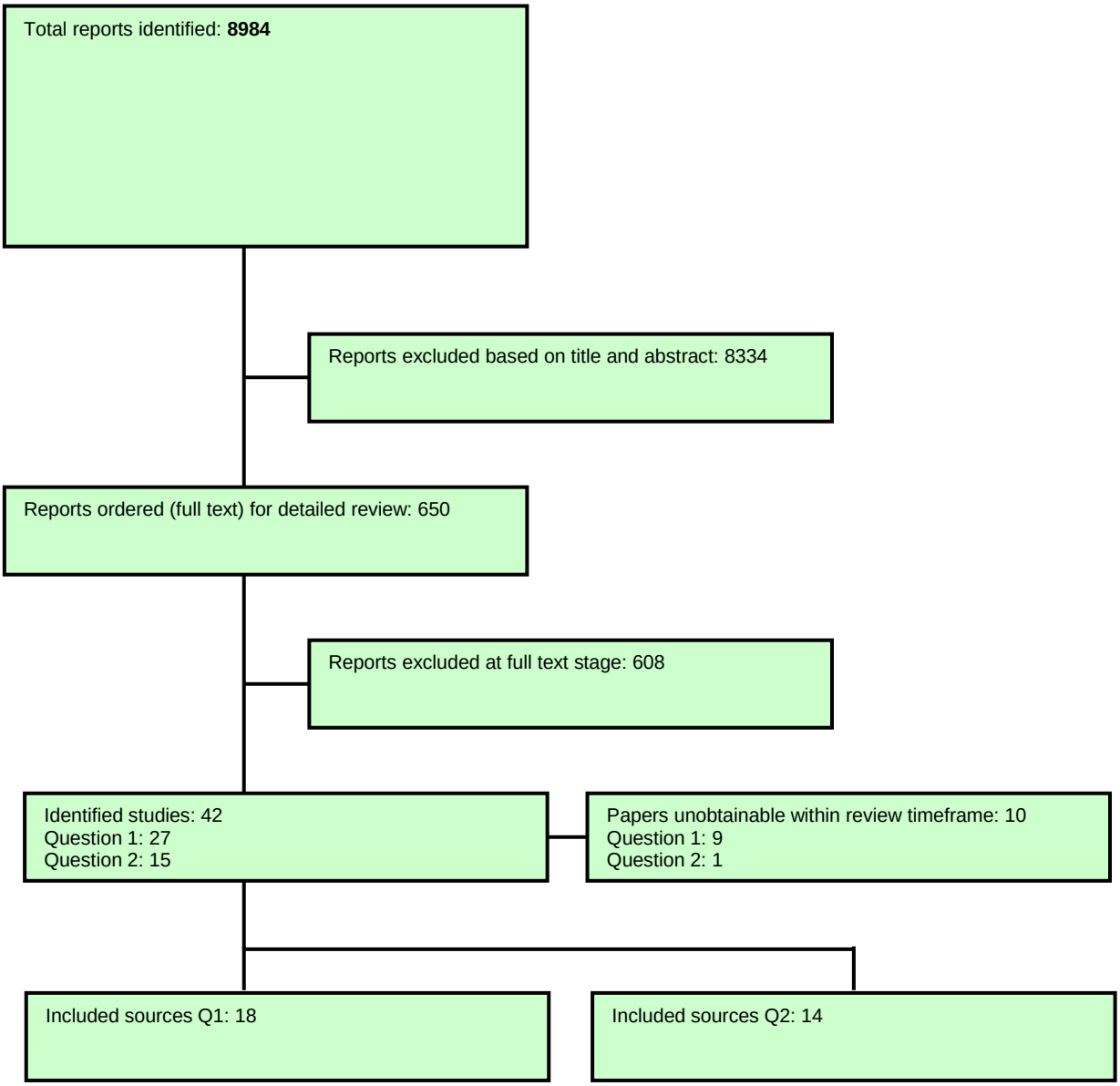
Review sections on theoretical approaches was drafted by one reviewer (RG) and commented on by other reviewers (MP, HH and RA) who suggested other included texts, expanded or refuted the draft. Not all texts were treated equally. Those which articulated the theory of the whole system approach most informatively provided the bulk of the information, structure and conceptual weight in the section.

Synthesising information from obesity programmes in practice was not straightforward due to differences in how they were implemented and the context in which they were implemented. We aimed to (1) describe the key characteristics of the programme and their relationship to whole systems approaches and (2) identify common elements between programmes with regard to whole system approaches.

4. Summary of included studies

4.1. Identified studies

Figure 1 Review flowchart



5. Findings, Question 1: What, in theory, comprises a whole system approach to obesity?

Eighteen papers were identified that informed our understanding of a whole system approach in theory. The papers are summarised in Table 2. The table also shows how influential each source was in contributing to our understanding of a whole system approach.

Table 2 Summary of sources that informed our understanding of adopting a whole system approach (Question 1)

Author(s) and location	Title Type of document	Focus/aim of paper	In theory only?	Case examples used	Contribution understanding of WSA
Attwood et al UK	Leading change: a guide to whole system working. Book	To make the case for (1) whole system development' and to improve ways of working in the public, voluntary and community sectors and (2) to explore how organisations can be created and sustained such that they meet the needs of communities and society at large.	No	A number of public sector (health and community) examples from the authors' experiences of consultancy work are provided, but none relate specifically to Public Health.	High
Bauld and Mackenzie UK	Health Action Zones: multi-agency partnerships to improve health Book chapter	Outlines the key elements for the development of Health Action Zones (HAZs) and insight into the change processes undertaken, specifically what factors influenced whether HAZs were able to contribute to a whole system change to influencing the social determinants of health.	No	Some HAZs	High
Benington & Hartley UK	"Whole systems go!" Improving leadership across the whole public service system Report	To stimulate discussion and reform. Commissioned by the National School of Government and the Public Service Leaders Alliance; part of a wider group of studies into the public service leadership academies by the Cabinet Office	No	Every Child Matters agenda, Leaders in Partnership initiatives.	Low

Author(s) and location	Title Type of document	Focus/aim of paper	In theory only?	Case examples used	Contribution understanding of WSA
Berkeley and Springett UK	From rhetoric to reality: a systematic approach to understanding the constraints faced by Health For All initiatives in England Journal article	Drawing on experience of local Health For All (HFA) initiatives, European Healthy City (HC) projects and English Health Action Zones (HAZ), the authors develop a dynamic conceptual model showing how the governmental organisational, and initiative environments relate with each other and their cumulative effects on initiatives.	No	Using case examples from European Healthy City projects and English Health Action Zones	Low
Dooris (55-65) UK	Healthy settings: challenges to generating evidence of effectiveness Journal article	To outline the perceived benefits of a settings approach to public health and why evidence for effectiveness. Remains poor. An ecological perspective, understands settings as dynamic open systems focussing on whole system organization development and change.	Yes	Brief mentions of Healthy Cities, workplace interventions, Health Promotion hospitals, and schools	Low
Edgren Sweden	The meaning of integrated care; a systems approach Journal article	To describe a systems approach in relation health care.	Yes	No	Low
Hawe et al (267-76) Canada & Australia	Theorising interventions as events in systems Journal article	Describes the context into which theories about community interventions have been re-energised but fall short of what is required. To examine how the adoption of a dynamic, ecological, complex-systems approach could influence research and development in community interventions.	Yes	Minor examples given – not clear if these are based on actual experiences	High

Author(s) and location	Title Type of document	Focus/aim of paper	In theory only?	Case examples used	Contribution understanding of WSA
Hudson (75-94) UK	Analysing network partnerships: Benson revisited Journal article	The context that has given rise to the popularity of networks, the rationale for a network mode of governance and the key dimensions. Considers advantages of Benson's model of inter-organizational network (Benson 1975, 1982) as a useful framework.	Yes	None	Moderate
Hudson UK	Integrated care network – care services improvement partnership Report	To investigate taking a WSA in an integrated health and social care setting	No	Some examples around hospital admissions and discharge	Moderate
IDeA UK	Working as a whole system: improving the quality of life for older people. The older people's shared priority Report	To describe the ways in which a whole system operates and to give examples in the context of improving older people's quality of life.	No	Older peoples services in various English City and County Councils (Southampton, Thurrock, Kent, Lancashire, Manchester)	Moderate
Iles & Sutherland UK	Organisational Change: A review for health care managers, professionals and researchers Report	To provide a resource and reference tool for the literature on change management and consider the evidence available about different approaches to change	Yes	None	Low

Author(s) and location	Title Type of document	Focus/aim of paper	In theory only?	Case examples used	Contribution understanding of WSA
Information Policy Unit NHS exec UK	Working in partnership: developing a whole systems approach Report	To provide supporting advice and good practice examples when adopting whole system approaches for the planning, implementation and operation of information systems and services across a health community.	No	Good practice examples given but with minor detail provided.	Low
Plsek UK	Why won't the NHS do as its told - and what might we do about it? Report	To examine the problems with perceiving the organisation of the NHS as a machine.	No	None	Moderate
Pratt et al / Plamping et al (Plamping, Gordon, and Pratt) UK	Working whole systems: putting theory into practice in organisations/ Action zones and large numbers: why working with lots of people makes sense Book/ Report	To offer a radical way of thinking about organisations as living systems and practical methods of engaging with complex social and organisational issues	No	The London Health Partnership (est. 1994) later Urban Health Partnership. Focus was improving primary care services for older people. Parallel programmes were started in Newcastle and North Tyneside and in Liverpool	High
Rowe & Hogarth (396-405) UK	Use of complex adaptive systems metaphor to achieve professional and organisational change Journal article	To explore the issues of professional and organisational change (brought about through use of a Complex Adaptive Systems approach) in health care organisations.	No	Primary Care Trust where a pilot site to explore and implement new roles for School Nurses and Health Visitors had been established. This involved a 'comprehensive change programme', based on a CAS model of change.	Moderate

Author(s) and location	Title Type of document	Focus/aim of paper	In theory only?	Case examples used	Contribution understanding of WSA
Senge USA	The Fifth Discipline: The Art and Practice of the learning organisation Book chapters	Focussed on building learning organisations that can truly learn how to tap into their people's commitment and capacity to learn at every level of the organisation.	No	Mostly business examples	Low
Stacey UK	Complexity and creativity in organisations Book	To explore how the science of complexity might provide us with useful frameworks for making sense of life in organisations.	No	Examples from computer modelling but also organisational examples	Moderate
Zimmerman et al Canada	"Tales" Book chapter	A resource book for complexity science.	Yes	Examples from US private medical centres, physician groups and (non-healthcare) industry.	Low

5.1. What are the key features of a whole system?

This subsection draws on the work of Butland, 2007; Hawe et al., 2009; Plamping et al., 1998; Plsek, 2001; Pratt, 2005; and Rowe et al., 2005.

A whole system approach draws on complexity science and complex adaptive systems. These explain the ways in which factors and relationships interact and create particular sets of outcomes. They can be used to explain current circumstances (such as how social, economic and physical changes have resulted in an obesogenic environment (Butland et al.)) or, as we focus here, describe ways in which people and organisations, and the relationships within and between them, can be conceived.

In complex adaptive systems, while individual elements have their own identity, they are also dependent on others within the system leading to complex networks of interdependent entities (Rowe and Hogarth 396-405). The systems and interactions are not fixed, but continually grow, adapt, repair and evolve in response to stimuli within and outside the system. These responses may not be entirely predictable, but the system is self-regulating and follows simple rules from which ordered patterns of behaviour emerge.

Traditionally, organisations have often been conceived in terms of mechanical, hierarchical systems with predictable chains of cause and effect (Pratt, Gordon, and Plamping). Such systems typically rely on top-down management and associated bureaucratic approaches to monitoring and control. Such structures may be less effective when systems become more complex, as in complex public health problems (Pratt, Gordon, and Plamping).

Systems theories use natural rather than mechanistic metaphors when trying to understand how organisations function. In complex systems, very complex outcomes can arise from a few simple rules of interaction (Pratt, Gordon, and Plamping). Rowe and Hogarth (2005) suggest this is one of a number of key characteristics of a complex adaptive system (see Table 3 below).

Imposing complex targets and plans for an organisation or intervention may stifle the system's adaptive ability and creativity (Plsek). Changes and effects are not necessarily linear and there may be magnifying effects from positive or negative feedback loops. Events may interact with each other in unpredictable ways which may be helpful or undesirable. Small changes can have big effects and vice versa (Plsek).

Table 3 Features of complex adaptive systems

- Complex adaptive systems will be self-organising and new elements will emerge at various points. These changes may be incremental or dramatic as they adapt to reactions between subsystems and with other systems.
- Uncertainty is inevitable in an evolving system, rendering top-down control impossible. The views and experiences of those at a variety of points in an organisation are necessary to gain an understanding of it.
- Spontaneous change occurs more readily where there are a range of different behaviours (micro-diversity).
- Agents of an organisation act according to their own internal rules or mental models. Attractor patterns within the system will "frame" or limit change.
- Simple rules or guiding principles can lead to innovative emergent changes.
- Change can be stimulated by the encouragement of new generative relationships. These can produce new insights and solutions to complex problems.
- There will be simultaneous stability at the edge of chaos, this being a requirement for the emergence of novelty.

Source: (Rowe and Hogarth 396-405)

Systems can exist within single organisations or between multiple organisations, and a variety of different systems may exist concurrently and interact. Different authors may use the terminology of systems in quite specific ways. For example Plamping et al (1998) state that they do not use the term system to refer to fixed organisational structures, such as a benefits system or hospital, but to something that assembles itself around a shared sense of purpose.(Plamping, Gordon, and Pratt)

In considering groups and systems rather than individuals, Hawe *et al* (2009) suggest that "more is different," and contend that a fundamental shift in thinking is required in the field of change processes. (Hawe, Shiell, and Riley 267-76)

5.2. What are the implications of whole system thinking for ways of working?

This subsection draws on the work of Attwood et al., 2003; Benington & Hartley, 2009; Dooris 2006; Hawe et al., 2009; Hudson, 2004; Hudson, 2004b; Information Policy Unit NHS Executive, 2000; Plsek, 2001; Rowe et al., 2005; Senge, 1993; and Stacey, 1996. It considers how such management differs from traditional models of organisation and then outlines some of the key features of this new approach.

5.2.1. Managing a whole system

Working within a whole system creates a new set of priorities, away from target driven goals, and those focused on individual, short term interventions and towards a more holistic approach which engages all the people in the system in designing and implementing sustainable change (Attwood et al.).

Organisations conceived as operating in terms of hierarchical mechanisms require a "system controller" to set goals, lead implementation and monitor progress. Top-down targets, with their associated inspection and control, may damage genuine efforts of organisations, communities and individuals to improve the way services work on the ground. (Attwood et al. 2003). Such an approach may be particularly inappropriate in situations where collective goals are less well defined, the time frame is long and the behaviour required to produce solutions is less knowable (Hudson 75-94).

A complex systems approach requires facilitative leadership that encourages creativity, and which relies on the coordination of strategies from actors with different goals and preferences around a particular problem within existing networks (Hudson 75-94;IDeA). Change is provoked by increasing the possibilities for the system to adapt, and facilitating the development of new relationships within and between systems (Rowe and Hogarth 396-405). Leadership is based on recognising the

inherent effort, ability, creativity and work-ethic of people working in an organisation (Attwood 2003) and facilitating their achievements. This encourages engagement and involvement between different people in the systems (Attwood et al.) and full exploration of problems and existing approaches before developing possible solutions (Benington and Hartley).

Plsek (date) emphasises that complex adaptive systems do not have a predictable trajectory. Attwood (2003) also states that leadership in a whole system approach helps bring about a collective, emergent direction, with members only taking the lead when circumstances demand (rather like a jazz band). Furthermore, difference and diversity are valued, groups and individuals involved are flexible and responsive, and ultimately in pursuit of a common aim (Atwood 2003).

Problems may arise where the movement towards systems thinking has been partial or not underpinned by theory (Hudson 75-94;Dooris et al. 327-52;Hawe, Shiell, and Riley 267-76). For example, policy makers may be impatient with the time genuine partnerships can take to emerge, and revert to top down processes through compelling the formation of “mandated partnerships” which then need to be managed through increasing bureaucracy and hierarchy (Hudson 75-94). Arguably, these are not genuine partnerships and run the risk paying lip service to organisations participation and any proposals that they make.

Organisations may embraced complexity as an explanatory concept, but fail to take on board the implications for any response to the problem. For example, an intervention with multiple strategies directed at multiple levels (eg child + family + school) comes to be seen as taking a systems approach, while little theory is put forward about how these levels impact on the intervention or outcomes (Hawe et al. 2009). In a systems response change would be provoked, not by detailed plans and instructions, but by attempts to increase the possibilities for natural adaptation (Rowe and Hogarth 396-405).

Where the nature of the system is not acknowledged from the beginning, the tendency for the system to self-organise may negate the efforts of organisations to control them (Hawe et al. 2009). Target setting in one part of a system, for example, can have negative effects in another part of the system. Contradictory and potentially self-defeating approaches may emerge (Plsek). It has been suggested that moves

towards decentralisation may magnify these tensions because policy makers may grow impatient with the slowness of addressing an issue and initiate legislation, guidance or regulation aimed at compelling the creation of hierarchal partnerships at a local level.(Hudson 75-94).

Similarly, there are some approaches which are labelled as "whole system working" but which we have not considered to be "authentic" because they reproduce precisely these hierarchical, bureaucratic, highly contained and monitored mechanisms. An example of this is *Working in partnership: developing whole systems approach* (Information Policy Unit NHS Executive). This sees systems working primarily in terms of "big picture" thinking, trying to work across complex organisational environments and assessing the links and relationships between them. However, recommendations for joint working remain entrenched in systems of management and control. Thus partnerships can be mandated and organisations are not allowed to opt out, alliances are formalised and performance management is key. Although some key aspects, such as the need for cross organisational respect, do align with other descriptions of whole system working, there are no proposed mechanisms for facilitating these, and indeed the existence of bureaucratic methods of controlling these partnerships may work against them (Information Policy Unit NHS Executive).

5.2.2. The importance of relationships

A central concern of systems working is to harness and facilitate individual and organisational relationships (Plsek;Pratt, Gordon, and Plamping;Hawe, Shiell, and Riley 267-76;Stacey;Attwood et al.;Pratt, Gordon, and Plamping). Whole system thinking focuses on the informal, "shadow" networks, as well as formal ones (Stacey), with solutions developed by sharing tacit and informal knowledge through relationships within and between organisations, recognising that answers may be subject to alteration and improvement (Senge;IDeA) (Hudson). Social relations are key, for example, to bridge networks and increase opportunities for interaction and exchange (Hawe, Shiell, and Riley).

The "entangling strings" of reputation, trust, friendship, inter-dependence and altruism become an integral part of relationships (Stacey;Hudson). Authors have also considered the development of "cooperation, altruism, loyalty and solidarity" as key

(Hudson). Difficulties can arise where there are territorial claims by particular groups or organisations and methods, such as those proposed by Pratt et al, need to find ways of alleviating these as well as the impact of sex, gender, race, class *etc*. on interpersonal relations (Hudson). Popay and Williams highlight that partnerships are relationships, and relationships are inevitably about power and control, but they are also to do with dialogue, negotiation, and the development of shared perspectives (Popay and Williams). Peer led interventions and peer-education can be seen in this context as a way to increase the credibility of those involved in the eyes of the citizens with whom they are working (Hawe, Shiell, and Riley).

While Pratt et al concentrate on ways of bringing together people in the system to explore problems and produce local solutions, Hawe et al suggest that other "settings" may be created, including interventions, which can be harnessed through systems thinking. "Settings" are "time and space bounded patterns of behaviour" which are either location bound (schools, workplaces etc.) or activity focused (sports games, meetings etc.). Dooris (2006) also focuses on the relationships between systems thinking and settings, by which he means interventions which are aimed at enhancing the healthiness of the specific places of people's everyday life – schools, workplaces, neighbourhoods and so on. These are themselves complex systems, which also function as part of a larger whole "an open system with synergistic exchange with the wider environment" and with other settings within this (Dooris). It is noted however, that interventions which introduce a single focus into a particular setting (such as smoking prevention in schools) are often just perpetuating individually targeted risk reduction strategies in a particular setting (Dooris). Broader salutogenic targets are required to enhance the health supporting nature of the system as a whole.

With such potentially nebulous and personal characteristics occupying a central role on the creation of healthy systems, there needs to be a focus on how to facilitate the development and maintenance of relationships (Hudson 75-94).

Working Whole Systems by Pratt et al (2005) was one of the few texts identified which discussed the processes that might be used to achieve a systems approach in practice. They discuss bringing people together, often in large meetings, to produce shared understandings which are crucial for effective systems working. They refer to these as "events" in the system but have echoes of "settings" as used by Hawe et al.

For Pratt et al, meetings are settings which build new connections, relationships and possibilities that enable creative development of new approaches.

The authors largely based their understanding of the practicalities of whole system working on a drive to improve older people's services that was undertaken by the Urban Health Partnership in various English locations in the mid 1990s. Their ideas show the interconnected way in which key characteristics of whole system working behave and how a whole system theory could be envisaged to work in practice.

Although Pratt *et al*'s nine key characteristics of whole system working are described sequentially (as table X, below), they are presented in the book in a wheel "to allow us to pay attention to one aspect at a time while keeping awareness of the whole" (Pratt, Gordon, and Plamping).

Table X. Pratt et al's Key characteristics of whole system working

Meaning	"System" is used to describe the people and organisations who come together around a shared purpose and meaning, working to find a common ground through open dialogue. Time is needed to explore purpose and possibilities and avoiding providing quick "solutions" based on an *assumed* concurrence about what the problems actually are. Discovering areas of shared purpose may mitigate against this tendency.
System that knows itself	When people recognise that they are part of the system, together with a sense of the system's actions, purpose and boundaries, change becomes possible and new actions and ways of working with others emerge.
Many perspectives	Whole system working encourages active participation of lay members and may defuse existing antagonism between organisations and groups by "a shared experience of listening and being listened to". Finding constructive ways of working with diversity is critical, as is the language used to describe the issue because "that is the way people recognise whether….. they are part of the system". Finding the right people to join in is critical, and there needs to be a sufficient mix to support new connections, combination and possibilities.
Participation	"Event" attendees participate as individuals, rather than representatives of organisations to allow people to hear criticisms of their organisation and to allow personal, rather than institutional, commitment to be made (ie participants only agree to what it is in their power). This taps into informal/"shadow" networks and allows people to recognise that they can act as co-producers of new solutions. If someone who is needed to take action is not there, they can be seen as crucial part of the system and efforts can be made to engage them in future.

Web of connections and communication	Building networks of personal connections is essential. Communication needs to circulate as the capacity to get things done is widely distributed. Positive connections and relationships can grow from repeated opportunities to share experiences and explore collective meaning. Small considerations, such as people meeting each other at round tables and limiting the size of groups, can help generate a sense of "all being in this together".
Trusting local resourcefulness	Trusts that local people, groups and organisations can be sufficiently resourceful to adapt without external design. The system will order itself around shared meaning and purpose produced within the system. Enhancing connections and communication helps recognise the capacity and collective expertise within the system and to plan how they can be used. These activities need support and encouragement from those with financial, managerial and organisational power if they are to continue.
Passion	Bringing people together must rely on their own interest and they can self-select to take part in things they care about. Formal networks may only view certain kinds of evidence as legitimate (such as quantitative data, analyses and abstractions); meetings of informal networks seek out stories and anecdotes from those involved and complex problems can be explored without rushing to offer solutions.
Here and now	Systems operate "in the here and now", with many interactions and processes taking place simultaneously. This can look messy but gives people enough time and space to establish shared purpose and meaning and to become aware of themselves as part of a system. This allows them to act in ways that support this discovered shared purpose.
Patterns of order	A few principles that guide human behaviour create coherent patterns of order, and that people can choose to change these principles. Order is about pattern and representing the system when everything is in its proper place performing its proper function.

Other authors construct similar lists of core values for whole system working that largely overlap with this approach. For example, the ten "key principles" listed by Attwood et al (2003) are shown in the table below.

Table 4 'Key principles' of a whole system approach

Principle	Explanation
Optimism	People and organisations have the capacity to learn and the commitment to tackle dilemmas and intractable 'problems'
Empathy and humility	In the face of the tough challenges faced by those who are charged with, or voluntarily take on, a whole system agenda.
Tenacity and courage	To question assumptions and current ways of working
Learning	Putting learning at the heart of what we do and a recognition that it is as important to honour what is and what works as it is to encourage new ways of thinking and acting
Relationships	Relationships that are founded on the pursuit of mutual understanding and preparedness to negotiate, share learning and experience from elsewhere and working through problems.
Whole system perspective	Resisting fragmented 'one size fits all' approaches and seeing organisational and community issues within the wider environmental context.
Local knowledge for local solutions	A bias towards the use of local knowledge, held by individuals, communities and organisations, to create local solutions.
Building social capital	An active appreciation of the personal qualities and experiences of the people with whom we work and a determination to involve them in designing processes that will strengthen learning and build capacity and social capital.
Celebrating small steps	A welcoming of the small improvements that demonstrate the practical possibilities and potential for learning in whole system development.
The long view	Being there for the long haul rather than the quick fix. Meaning and purpose are hard to get at when the process starts in abstract discussion, so meetings use stories and personal experience

Source: Attwood et al 2003

5.2.3. Working with local networks

Hudson uses Benson's model of inter-organisational networks to understand key network relationships and attitudes (Hudson, 2004). This model responds to the holistic and dynamic nature of systems, describing four "domains" required in healthy networks and systems at the local level:

- **Domain consensus -** the degree of agreement about the role and scope for each agency in the system (enhanced where members have self awareness within the system).

- **Ideological consensus –** the degree of consensus about the tasks faced, and the most appropriate way to approach them. As members become more familiar with each other, the opportunities for shared values and understanding increase, as do the social constraints associated with increased feelings of familiarity, trust and respect. Structural embeddedness is crucial in the development of consensus in successful systems but may take time to develop.

- **Positive evaluation -** the ways in which members regard each other. Trust and positive evaluation are vital and may be enhanced through regular personal contacts across organisational boundaries.

- **Work coordination -** the alignment of working patterns and culture. This is particularly important for complex, simultaneous activities. Professionals may feel uneasy about being managed by others in the system, however, and be unwilling to subordinate their views to others.

Many of Hudson's conclusions echo those of Pratt et al (Pratt, Gordon, and Plamping).

Local factors were also viewed to have impacted on the success of Health Action Zones (HAZ), sustaining local strategic development even where the national picture was changing (Bauld and Mackenzie). Indeed, the HAZs which used features of a WSA - prioritising learning and adaptation, working with the system, capacity building, and planning and mainstreaming – appear to have been successful overall. Commitments and approaches to learning and evaluation varied; some areas relied on monitoring procedures, but others, more fully adopting the whole system understanding, made efforts to build in learning at a project level or even developed strategic frameworks at the outset which that allowed them to integrate learning generated at different levels (Bauld and Mackenzie). Attempts to mainstream initiatives to enhance sustainability also varied, with some areas planning for this from the outset, while others only responded when it became clear that national funding would not continue indefinitely. In addition, some strived for policies and practices to

be sustained (indicating healthy systems), as well as individual projects, and generally, these HAZs reported greater success. Finally, some HAZs took a dynamic view of partnerships and recognised that renegotiating partnership approaches was "an integral part of systems change", enabling them to respond more creatively to change (such as new governance arrangements).

Hudson suggests that "policy networks" also interact in complex and dynamic ways, and that four factors are crucial to the successful development of whole system approaches (Hudson 75-94):

- **Fulfilment of programme requirements -** Agencies will be reluctant to undertake tasks that interfere with the fulfilment of on-going programmes (eg pressure to meet targets) or where priorities are at odds with the partnership.
- **Clear domain of high importance** - ensuring that the partnership agenda carries public legitimacy and support.
- **Reliable patterns of resource flow** - risk of devaluing the role of those not in control of large budgets.
- **Application/ defence of the organisation's paradigm -** the extent to which individuals view themselves as working for the network rather than as a representative of an organisation.

5.2.4. Local solutions to complex problems

Whole system working focuses on the ability of local action to find creative solutions for local problems. Broad areas for action can be agreed, but the local way of approaching these relies on local networks, organisations and individuals to creatively address those issues. Attwood et al suggest that systems approaches aim for "equifinality", where different, but equally valid, paths can be taken which lead to the same place.

5.2.5. Relationships between national policy and local action

Complex systems and networks are considered to be largely self-regulating. As such, national bodies steer and facilitate local action but do not totally control local systems (Hudson 75-94) (Pratt, Gordon, and Plamping). However, Hudson notes that the implementation of national policy by local networks remains little understood (Hudson 75-94). Specification and detailed plans may stifle creativity; complex outcomes may emerge from minimum specification that aligns values and meaning (Plsek;Rowe and Hogarth 396-405).

For Health Action Zones (HAZ), Bauld and Mackenzie (2007) noted that three factors at the national level affected the ability to develop and implement local strategies: (1) the extent to which the national policy was conducive with approaches that HAZs wished to adopt (2) Whether there was stability of intent in relation to the HAZ initiative and (3) Whether political leadership remained focused on the goal of tackling health inequalities. In practice, these were disrupted by a change in ministerial leadership and the shift in agenda from seeking bottom up solutions to local problems towards achieving national targets (Bauld and Mackenzie). This was seen as stifling innovative agendas, and there was scepticism about the resultant monitoring goals ability to understand programme intent or progress locally. This suggests that the whole system thinking which informed initial purpose and processes for the HAZs was compromised by a return to mechanistic methods of managing them.

National level commitment to evaluation and its feedback was perceived to facilitate collaboration between national and local level evaluation through sharing approaches and funding a web based system to promote learning as well as funding local research (Bauld and Mackenzie). However, as decisions about future funding were taken prior to completion of the national evaluation, commitment to mainstream policy learning was questioned (Bauld and Mackenzie). Support from local partners was compromised by the message that national funding would not continue as originally planned. Other national decisions also threatened the sustainability of HAZ – the development of new policies which absorbed energies away from the programme and organisational developments across local authorities and primary care, both of which were key partners.

5.2.6. Healthy systems

The shift to systems thinking places the emphasis on the robustness and sustainability of the system itself, rather than focusing on individual actions or interventions. Hawe et al (2009) argues that conventional thinking focuses over simplistically on the "package" of activities or their educational messages whereas a systems approach focuses on the context into which the intervention is introduced (Hawe, Shiell, and Riley 267-76). Pratt et al also state that working with systems means going beyond looking at a series of project based interventions (Pratt, Gordon, and Plamping). Slippage in the language may also lead multi-level/ multi-factor/cross-sector interventions to be described as "complex" (Hawe, Shiell, and Riley 267-76). Hawe *et al* also suggests that while methods for trying to manage and evaluate the impact of interventions – such as theories of change or intervention mapping - may enhance understanding of what happened as part of the intervention, they are limited in terms of helping to understand the implications of complex systems (Hawe, Shiell, and Riley 267-76). It is suggested that one "think of interventions as events in systems that will either leave a lasting footprint or wash out depending on how well the dynamic properties of the systems are harnessed". (Hawe, Shiell, and Riley 267-76).They suggest that an "ecological systems view" should be taken, where organisations are settings in which actions occur. Pratt et al also place less value on the outcomes of any particular activity. Rather they value enhanced system robustness, creativity and sustainability (Pratt, Gordon, and Plamping).

5.3. Implications of a whole system approach for evaluation

This subsection draws on the work of Attwood et al., 2003; Bauld & Mackenzie 2007; Dooris, 2006; Hawe et al., 2009; Pratt, 2005; Rowe et al., 2005.

Interventions may themselves be part of the process which changes the local environment. As such, learning and evaluation can be seen as central to a system approach, and may be the mechanisms through which a system adapts and regulates itself (Bauld and Mackenzie). However, traditional targets and outcomes - focusing on the evaluation of individual interventions - may fail to capture the "added value" of

system working (Dooris 55-65). Hawe *et al* note that while traditional assessments of interventions focus on the impact of new activity, systems evaluation may also wish to consider the impact of displaced activities (ie those which stopped when the intervention began). Dooris suggest evaluation of a systems approach should *"*attempt to map and understand the interrelationships, interactions and synergies within and between settings". (Dooris 55-65).

Previously, programme fidelity has referred to assessing whether the planned intervention was delivered across many sites. In a whole system approach, it is the *function* of the intervention, rather than the *form* that is key (Hawe, Shiell, and Riley 267-76). Therefore, knowing about *how* organisations operate is more important that "what works" in terms of the interventions they operate (Attwood et al.). It is the effectiveness of the entire network that is important, rather than individual components (Hudson 75-94).

Hawe et al suggest that concepts such as embeddedness, institutionalisation and sustainability become key to establishing the success of a programme. This could be evaluated through the extensiveness of the programme across the system or the intensiveness of its integration into routine practice. (Hawe, Shiell, and Riley 267-76)

Much of the focus of whole system working - such as developing relationships, improving networks and communication and developing a shared sense of purpose - are difficult to measure and evaluate (Pratt, Gordon, and Plamping). It has been suggested that analysing networks could help track structural relationships over time (Hawe, Shiell, and Riley 267-76). This might help map informal/"shadow" networks, through identifying how many contacts people in and across organisations have (network density), whether networks become more robust or whether links become lost, or reliant on just a few individuals (Hawe, Shiell, and Riley 267-76). Increasing the network density may positively affect the sustainability of obesity prevention activities. Prospectively tracking such changes could inform the future strategic direction of interventions, attempting to harness positive feedback and counteract negative feedback loops (Hawe, Shiell, and Riley 267-76).

Different techniques, including qualitative research, may be required to evaluate the success of a system approach (Hawe, Shiell, and Riley 267-76). For example, using whole system thinking as a framework for assessing the differences in HAZ

approaches, Bauld and Mackenzie used qualitative research with key stakeholders to uncover findings related to relationships between organisations, citizen involvement, shared learning, and structures that supported this kind of working. While routinely collected statistics on a range of indicators were used for localities, inconsistent results were seen.

A final consideration is that systems changes, and non-linear changes, may require longer time frames for evaluations (Hawe, Shiell, and Riley 267-76).

5.4. Potential difficulties with whole system working

This section draws on the work of Attwood et al., 2003; Rowe et al., 2005; Stacey, 1996.

Rowe and Hogarth describe using a complex adaptive systems approach to develop alternative ways of doing things within a health visitor service. Although the approach allowed long standing assumptions about change and service delivery to be challenged, it had considerable emotional impact on practitioners due to destabilising organisational and professional norms. The authors noted that the impact of a systems approach on staff had been underplayed in the literature (Rowe and Hogarth 396-405).

Attwood et al also note that whole system ways of working can be uncomfortable for those used to traditional management practices due to their uncertainty, ambiguity and inability to provide a "quick fix" (Attwood et al.) The process of letting go of old patterns of work, in order to try and facilitate new ways of working, is challenging (Stacey).

5.5. Implications for defining a whole system approach

- A whole system approach can be characterised in theory and in practice
- The emphasis has moved from classical framing of interventions through people, organisations and interventions

- The conditions within which people operate are key to the whole system approach

This section has tried to define some key characteristics of a whole system approach in theory to addressing complex health problems. In summary, these are:

- an holistic approach to intervention, with issues addressed ‘in the round’ and not in isolation;
- an emphasis on the relationships between levels;
- the use of lay knowledge and the expertise of non-specialists;
- the use of systems language;
- the system being self-aware;
- a focus on the manner in which individuals and groups engendered progress in their area;
- deliberate efforts to build capacity
- a focus on process rather than outcomes
- the system as a self-supporting body; and
- continual, and unpredictable, evolution.

6. Findings, Question 2: What, in practice, comprises a whole system approach to preventing obesity at the local level?

6.1. Overview of obesity prevention programmes

Our search did not identify any obesity prevention programmes that met the criteria for an "authentic" whole system approach, ie comprising *all* of the key characteristics of a WSA, as outlined in the previous section. It was therefore necessary to widen the definition of a 'whole system approach' to include those programmes which were designed to work at multiple levels among multiple agencies in a locality. We have tried to assess these programmes in terms of their proposed function to gain a sense of the extent to which they used approaches which mirror a "whole system approach"

Programmes had to include elements such as capacity building, the fostering of local innovation, and/or the development of relationships and communication between individuals and/or organisations. Information about the programmes that fulfilled these criteria was sourced from a range of document types. It should be noted that gaining a full understanding of how programmes were implemented was problematic as the information provided on implementation in eg journal papers or strategy documents was often limited. As such, detailed accounts of how aspects of the programmes were implemented, such as community engagement or capacity building, were often not available in the identified sources. Therefore, because of the limitations in reporting by authors, we may not have given a programme credit for pursuing an approach that in reality it did.

The included programmes are summarised in table 6 below. In line with Hawe et al's (Hawe, Shiell, and Riley 267-76) distinction between the *form* and the *function* of a programme designed to address a Public Health issue. Table 6 therefore provides a brief overview of the form that the programme ie whether they addressed all potential areas – education, diet (food and drink), physical activity, environment (or setting) and media – and (2) the *function* the programmes aimed to attain, assessed against the key characteristics of a "whole system approach" (please see table 10 in the full,

unedited version of this review for detailed information about programme form). This is as suggested in the previous section, ie:

- whether or not the principles of whole system working explicitly informed the design and implementation of the programme
- the extent to which capacity building within communities and organisations was an explicit goal
- the extent to which local creativity and/or innovation was encouraged
- a description of the methods used to develop working relationships between individuals or individuals and organisations
- a description of the methods for engaging community members in programme development and delivery
- methods for enhancing communication between actors in the system

Table 6 Obesity prevention programmes

				Function of programme: key ● - means of attaining element explicitly described, or clearly stated as a goal ○ - programme element mentioned, but means of attaining not described - - programme element not mentioned					
Programme Date Reference	**Overview**	**Address all areas?** • **Education** • **diet** • **PA** • **environment** • **media**	**Levels of action** **Sectors involved**	**Whole system working**	**Capacity building**	**Local creativity**	**Relation-ships**	**Engage-ment**	**Commun-ication**
NATIONAL									
EPODE (Ensemble, Prévenons L'Obésité Des Enfants) 2004-2009 (Anon. 2005/ Westley 2007)	Ten towns in different regions of France aiming to prevent child obesity though simple guidelines, avoiding stigmatization and encouraging families to pass on food culture. Town funding matched by private sector partners.	No – not environment	*Level* Individual Family School Comm. *Sectors* Public Private	-	○	-	○	-	-
REGIONAL									
California Healthy Cities & Communities 1987 onwards (Twiss et al. 2000)	Based on WHO Healthy Cities model, fostering a social movement for health and promoting organisational / policy change. Emphasis on communities developing own appropriate projects.	No – not PA	*Levels* Individual Family School Comm. PH policy *Sectors* Voluntary Public Private	-	●	●	●	●	●

				Function of programme: key ● - means of attaining element explicitly described, or clearly stated as a goal ○ - programme element mentioned, but means of attaining not described - - programme element not mentioned					
Programme Date Reference	**Overview**	**Address all areas?** • **Education** • **diet** • **PA** • **environment** • **media**	**Levels of action** **Sectors involved**	**Whole system working**	**Capacity building**	**Local creativity**	**Relation-ships**	**Engage-ment**	**Commun-ication**
North West framework to achieve healthy weight in children and families 2008-ongoing (NHS North West et al. 2008)	UK based programme focused on children's weight, diet and activity, aimed at supply and demand.	Yes	*Levels* Individual Family School Comm. *Sectors* Public Private	-	-	-	○	-	○
Pacific OPIC Project (Obesity Prevention in Communities) 2002-2008 (Simmons et al. 311-24)	Programme in Fiji, Tonga, New Zealand, Australia using ANGELO framework to integrate research, local evidence and experience with engagement with stakeholders so agreed priorities were achieved.	Yes	*Levels* Individual Family School Comm. *Sectors* Voluntary Public	-	-	○	○	●	-
CITY OR TOWN									

				Function of programme: key ● - means of attaining element explicitly described, or clearly stated as a goal ○ - programme element mentioned, but means of attaining not described - - programme element not mentioned					
Programme Date Reference	**Overview**	**Address all areas?** • **Education** • **diet** • **PA** • **environment** • **media**	**Levels of action** **Sectors involved**	**Whole system working**	**Capacity building**	**Local creativity**	**Relation-ships**	**Engage-ment**	**Commun-ication**
Be Active Eat Well 2003-2006 (Sanigorski et al. 2008)	Programme in Colac, Victoria, Australia to build community capacity to crate own solutions to obesity, addressing skills, policies, creating partnerships, building leadership and community ownership.	Yes	*Levels* Individual Family School Comm. PH policy *Sectors* Public Private	-	●	●	●	●	○
Healthy City (Sheffield) 2009-2013 (Anon. 2008)	Stated whole city approach in Sheffield UK using Sheffield First partnership to co-ordinate obesity prevention work.	No – not education	*Levels* Individual School Comm. *Sectors* Voluntary Public Private	-	○	○	-	-	-
Healthy Living Cambridge Kids 2004-2007 (Chomitz et al. 2010)	Programme in Cambridge Massachusetts, USA aiming to harness and increase grassroots capacity to mobilize interventions and evaluate their outcomes.	Yes	*Levels* Individual Family School Comm. PH policy *Sectors* Public	-	○	○	-	-	-

				Function of programme: key ● - means of attaining element explicitly described, or clearly stated as a goal ○ - programme element mentioned, but means of attaining not described - - programme element not mentioned					
Programme Date Reference	**Overview**	**Address all areas?** • **Education** • **diet** • **PA** • **environment** • **media**	**Levels of action** **Sectors involved**	**Whole system working**	**Capacity building**	**Local creativity**	**Relation-ships**	**Engage-ment**	**Commun-ication**
Healthy Town (Middlesbrough) 2008-ongoing (Heywood et al. 2008)	Programme in Middlesbrough UK o develop a sustainable, collaborative, multifaceted town wide approach to increase PA and healthy eating focusing on the most disadvantaged parts of the town.	No – not environment	*Levels* Individual Family School Comm. PH policy *Sectors* Public Private	-	○	○	●	●	○
Healthy Weight, Healthy Lives (Ealing) 2009-2012 (Anon. 2009)	Programme in Ealing, London, UK to empower everyone living, working or studying in Ealing to maintain a healthy weight . Aimed for delivery to be equitable, inclusive and empower communities.	No – not media	*Levels* Individual Family *Sectors* Public	-	○	-	-	○	-

				Function of programme: key ● - means of attaining element explicitly described, or clearly stated as a goal ○ - programme element mentioned, but means of attaining not described - - programme element not mentioned					
Programme Date Reference	**Overview**	**Address all areas?** • **Education** • **diet** • **PA** • **environment** • **media**	**Levels of action** **Sectors involved**	**Whole system working**	**Capacity building**	**Local creativity**	**Relation-ships**	**Engage-ment**	**Commun-ication**
Healthy Weight, Healthy Lives (Tower Hamlets) 2008-2012 (Anon. 2008)	Programme in Tower Hamlets, London UK, taking a system wide approach aims to address the wider social, economic and environmental drivers of obesity and promote self esteem, empower and produce sustainable lifestyle changes.	Yes	*Levels* Individual Family School Comm. PH policy *Sectors* Public	-	○	○	-	○	○
Romp & Chomp 2004-2008 (de Silva-Sanigorski et al. 2010)	Programme in Geelong, Australia, using community capacity building and sustainable change of policy and environment to increase capacity of city and Borough to promote healthy eating and active play to achieve healthy weight in children under 5 years.	Yes	*Levels* Individual School Comm. PH policy *Sectors* Public	-	○	-	-	○	○

				Function of programme: key ● - means of attaining element explicitly described, or clearly stated as a goal ○ - programme element mentioned, but means of attaining not described - - programme element not mentioned					
Programme Date Reference	**Overview**	**Address all areas?** • **Education** • **diet** • **PA** • **environment** • **media**	**Levels of action** **Sectors involved**	**Whole system working**	**Capacity building**	**Local creativity**	**Relation-ships**	**Engage-ment**	**Commun-ication**
Shape up Somerville: Eat Smart, Play Hard 2002-2005 (Economos et al. 2007)	Programme in Somerville, USA using a community phased participatory research approach using systematic inquiry, participation and action to address urban health problems.	Yes	*Levels* Individual Family School Comm. *Sectors* Voluntary Public Private	-	●	●	-	●	○
Westminster City Council 2009-2013 (Directorate of Public Health 2010)	Obesity prevention programme In London UK, part of a major health campaign aiming to optimise residents health and well being, with focus on inequalities.	No – not environment	*Levels* Individual School Comm. PH policy *Sectors* Voluntary Public Private	-	-	-	-	●	-

6.2. Summary of obesity prevention programmes

The majority of programmes were implemented in just one town or city, with the exception of the *California Healthy Cities & Communities* and *EPODE* which were implemented in a number of towns and cities across the state or country, respectively. The *North West framework* was not a specific programme, but a framework for addressing obesogenic environments in the north-west of England. Almost all programmes were designed to act at the individual, family, school, and community level and seven (*California Healthy Cities & Communities*, *Be Active Eat Well*, *Healthy Living Cambridge Kids*, and *Healthy Town (Middlesbrough)*, *Healthy Weight Healthy Lives (Tower Hamlets)*, *Romp & Chomp*, and *Westminster City Council*) endeavoured to impact on the wider system through changing policy to foster a less obesogenic environment.

The majority of programmes drew on a range of 'community' approaches, including community-based participatory research, community capacity, and 'whole city' approaches derived from the original World Health Organisation definition. Some programmes (e.g. *Healthy Town (Middlesbrough)* and *Healthy Weight Healthy Lives (Tower Hamlets)*) do not state an explicit approach, but nonetheless clearly have a strong basis in community approaches of this type where the involvement and development of the community are an integral part of the programme. There were a number of exceptions; the *North-West framework* and *Healthy Weight Healthy Lives (Ealing)* make no reference to how community involvement would take place, thereby significantly calling into question the extent to which this 'whole system approach' worked from 'bottom-up'. The *EPODE* programme was also notable for its clear hierarchical framework that, despite the possibility that local knowledge was used in the tailoring of programme elements in each town, suggests that a more 'top-down' approach was taken. The aims of the *EPODE* programme also suggest that a more traditional health professional led 'health education' approach was used, despite the involvement of actors from outside of the health professions.

Most of the programmes report that an attempt was made to elicit and use local knowledge in an effort to foster the genuine involvement of communities, but information on consultation with communities was often vague. However, there were

exceptions; *Shape up Somerville* reported meetings, focus groups and interviews with key informants as a means of developing the relationship with the research team and *Pacific OPIC* reported a detailed and structured approach to community engagement involving socio-cultural interviews, focus groups, and the use of the ANGELO framework in community workshops.

The intensity and richness of the working relationships between actors proved difficult to assess. While most programmes made some statement about the structure of the network and how communication between actors took place, there was often little detail about the 'real world' nature of these relationships. The *California Healthy Cities & Communities* programme was an exception in this respect reporting provision for fostering relationships within communities so that nominal cultural boundaries could be crossed, as well as providing emotional and spiritual support to help overcome the inevitable obstacles that would face the community. The programme also made provision for the involvement of key city government officials, managers and departmental heads as spokespeople for 'Healthy Cities', thereby providing a route for influencing local policy.

The sustainability of programmes, as indicated by the extent to which the programme was embedded into the community and the capacity of the community to obtain funding for future health initiatives, was frequently left unaddressed. For a programme such as *EPODE*, where a more 'top-down' approach was adopted, this deficit is less surprising as there appeared to be far less expectation that communities would 'own' the obesity prevention programme and continue it independently. However, sustainability issues also did not appear to have been considered in some programmes where there is far greater emphasis on the community development and involvement approach (e.g. *Healthy Town (Middlesbrough)*). Solid examples of making provision for sustainability are provided by the *California Healthy Cities & Communities* programme and *Shape up Somerville*; both of these programmes emphasise the importance of building lasting relationships between communities and public and private sector agencies, and of helping community members to attain the skills required to obtain funding that could enable the programmes to continue.

None of the identified obesity prevention programmes explicitly used whole system approaches. While *California Healthy Cities & Communities* and the *Pacific OPIC*

programmes mirrored a substantial number of whole system approach functions the majority of programmes only explicitly mentioned one of the key functions, although as previously noted, this may reflect limitations in the reporting rather than the reality of how programmes were implemented.

6.3. What factors facilitate or inhibit a whole system approach to obesity prevention at the local level?

An additional included source compared the approaches to obesity prevention in London (UK) and New York City (USA) (Libman, Freudenberg, and O'Keefe). Table 5 summarises the factors that facilitate or inhibit a whole system approach to obesity prevention in London and New York City.

Table 5 Factors facilitating and blocking municipal action to reduce childhood obesity

Factors facilitating and blocking municipal action to reduce childhood obesity		
	London	**New York City**
Factors facilitating municipal action	• Strong municipal control of transportation system • Explicit commitment to reducing inequities in health • National health care system that provides coverage to all • Relatively stable national funding for health care and education • Some business support for healthier eating options • National Child Measurement Program and Healthy Weight, Healthy Lives childhood obesity targets and program funding • Stated commitment to social determinants of health approach by Mayor and Regional Director of Public Health • London Health Observatory, an independent monitor of health trends • Olympics and commitment to health legacy	• Strong Mayor who supports vigorous municipal public health role • Strong health department with forceful leadership that supports vigorous role for public health • Health Code that enables action outside political process • Active and energetic non profit sector with interests in a variety of food and obesity issues • Public support for action to reduce obesity • Central school system with decision-making concentrated in Mayor's office • Many public officials with strong positions on obesity, food and health • City Council President, Mayor, Governor and President who have said health and food are priorities
Factors blocking municipal action	• Economic crisis that distracts public and policy maker attention • Food and retail industries with deep pockets to influence political process and	• Food and retail industries with deep pockets to influence political process and modest incentive to change

	modest incentive to change • Limited municipal involvement in public health • Decentralized/borough level authority over food and education • Competing priorities at different levels	• Economic crisis that distracts public and policy maker attention • Complex, often anarchic system of government that makes implementation of change difficult • Federal control of school food policy • Strong commitment to incrementalism • High value on individual responsibility as solution to social problems and corporate and political promotion of these values • Competing priorities at different levels • Food and retail industries with deep pockets to influence political process and modest incentive to change

Source: (Libman, Freudenberg, and O'Keefe)

7. Discussion

7.1. Statement of principal findings

There is a clear division in the way in which the language of a "whole system approach" is used in the literature. On the one hand, it represents approaches informed by theory about complex systems which propose radical new ways of organising, managing and evaluating local activities. On the other hand, it has been taken as the latest terminology in a long line of approaches which refer to cross-disciplinary, multi-agency, multi-level community activities aimed at addressing health concerns affected by complex socio-economic conditions and which, by this very nature, pose particular challenges.

We did not identify any papers which showed what we understand as an "authentic" whole system approach to the problem of obesity. However, given the nature of the approach, with its emphasis on enhancing capacity, improving relationships and creating space for innovative practices, we are also aware that this kind of information may not be visible in traditional write ups or evaluation reports. We remain cautious about this though, due to our perception of the centrality that comprehension of working within a whole system appears to occupy within an "authentic" whole system approach.

Working with an "authentic" whole system approach has profound implications for the way in which recommendations are made, interventions are designed, partnerships are encouraged and the impacts measured. However, we note that there is disparity amongst sources on the use of 'system' and 'systems' within the term "whole system approach". Some use the words interchangeably, and it is recognised that there are other perspectives on the use of this phrase. The use of the term 'whole' in front of system may arguably be redundant, as - whether dysfunctional or effective - a system is always whole by nature (Dina Berkeley, personal communication). However, consistent with the scope for this programme of work, "whole system" is used in order to reflect the approach as referring to a discrete 'system' construct, as opposed to an approach referring to nebulous multiple systems.

We acknowledge that our use of the term “authentic” to describe a particular whole system approach may be contested, on the grounds that the term implies an authority to adjudicate between different whole system approaches (Dina Berkeley, personal communication).

7.2. Transferability of a whole system approach theory to obesity prevention

The sources that informed our definition of a whole system approach are predominantly based on organisational management analyses, in both the public and private sector. We did not locate any sources that provided an analysis specific to Public Health organisations, but 12 of the 18 included sources (for Question 1) were based in analyses in the wider field of health or social care. Therefore, the extent to which theoretical whole system approaches are transferable to obesity prevention is unclear. However, Pratt et al. (2005) identifies three features of a system that, if they are present, give strong grounds for the transferability of whole systems theory across sectors and types of organisation:

- the presence in a network of a dense field of relationships
- the organisational need to respond and adapt
- the desire to organise in a manner that is ‘fit for purpose’, rather than simply on the basis of habit or historical precedent.

7.3. Limitations

Due to time limitations, we screened titles and abstracts only once, and were unable to return to this as the definition that we were building developed. We hope that this has not adversely affected our selection, but we cannot be certain.

Identification of all the important literature to inform a topic is always more difficult when seeking sources other than clinical trials. We used relatively limited topic language in our searches to define a whole system approach in theory, to ensure that the balance of specificity and sensitivity was reasonable in a time limited project. We have tried to mitigate missing key texts through using other search strategies,

including web searching, contacting key authors and citation searching. However, we are aware that we may have missed relevant texts, particularly grey literature.

Sources using terminology around “wicked issues” may have been useful, but we did not have the time to identify these. Similarly, management and change theory may have given more useful theoretical information than we had time to explore.

We are aware that the literature which we have identified for this report is less clear about how local, regional and national strategic thinking can help to support innovative whole system practice, than about the nature of relationships within the local systems.

We note that a number of potentially important sources became available too late to be included in this review; for example, the White House report on obesity (White House Task Force on Childhood Obesity) and the launch of the European Obesity Forum website (http://www.obesityforum.eu/).

We are not experts in complexity theory, management theory, change theory or the whole system approach, all of them complex theoretical areas, which we have tried to comprehend and critique within a short period of time. The possibility remains that we may have overlooked the nuances between the different accounts, or we may have focussed inappropriately on particular issues to the marginalisation of others. However, this review has been produced through a rigorous, intensive and documented process by a close-knit team of researchers without preconceived notions about the nature and meaning of a whole system approach.

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