

# GSR Behaviour Change Knowledge Review



Practical Guide: An overview of behaviour change models and their uses



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# Practical Guide: An overview of behaviour change models and their uses

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# Foreword

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Government Social Research Knowledge Reviews have been established to explore key areas of importance to social researchers throughout government. The overarching aim of the reviews is to improve how government social researchers conceptualise and measure fundamental concepts in order to enhance the use of social research in informing and evaluating policy, and measuring longer-term trends.

Behaviour Change was selected as the first review in recognition of the increasing importance of influencing behaviour in order to achieve positive policy outcomes. The review was set up and steered throughout by an Advisory Group of Government Social Research members.

This report is part of the first phase of work coming out of the review, which consisted of a synthesis of the evidence on the theory and principles of behaviour change with the aim of cutting through the vast amount of literature in the area and providing a starting point for research analysts in understanding behavioural change models. The Advisory Group are now considering how to take forward additional work in this area, particularly looking at the empirical evidence base and considering how models are applied in the UK public sector context.

The first phase of the review has resulted in two main outputs. This, the Practical Guide is the main report and summarises the key elements of Behaviour Change theory as well as providing information on the use of models.

Secondly, a longer Reference Report, has been designed as a resource for research analysts and other interested parties. It presents over 60 social-psychological Behaviour Change models and discusses in more depth issues to consider when using models to bring about change in individuals' behaviour. It also contains an electronic bibliography to assist the navigation of literature in this area.

Whilst this review is aimed primarily at GSR members we hope it will be a useful addition to knowledge held by other analysts and researchers from other disciplines, and policy colleagues – as achieving sustained behaviour change will only be possible through joint working across analytical disciplines and the policy process.

More information about the GSR Knowledge Reviews and links to all outputs can be found on the GSR website at [www.gsr.gov.uk](http://www.gsr.gov.uk).

**Government Social Research Unit**

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**Andrew Darnton**

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# 1

## Introduction

Over the last decade, there has been increasing recognition in the UK of the complexity of managing the performance of public policy. Policy makers now better understand that changing individual and group behaviour is often central to the effective delivery of policy outcomes. There is also a better appreciation of the importance of public preferences, attitudes, and norms in shaping behaviour.

In 2002, the Prime Minister's Strategy Unit published a report introducing the concept of 'public value' to the UK policy environment (Kelly, Mulgan and Muers, 2002). Public value refers to the value created by government through services, laws, regulation and other interventions. The report identified three key dimensions of public value – outcomes, delivery of services, and trust – and highlighted the centrality of public preferences across all three dimensions in determining that value. Crucially, it argued that value only exists if citizens – individually or collectively - are willing to give something up in return for it. This might involve monetary sacrifice (e.g. taxes and charges), but also granting coercive powers to the State (e.g. in return for security), disclosing information, and giving time or other resources (such as blood). Often then, this involves changing behaviour and this is much easier to achieve if policy makers give greater weight to public preferences – for trustworthy government, due process and fair treatment – in legitimising this change.

This 'practical guide' helps to explain why this is the case, and signposts analysts and policymakers to some of the analytical tools which have already been developed to understand behaviour, building on other syntheses of behaviour change work (see for example Halpern, Bates and Bales, 2003). It provides an introduction to the social-psychological literature on the factors which underpin individual and group behaviour, and combines it with that on how these can be influenced to achieve behaviour change. The focus is on social-psychological models (and the economic theory they build upon) because of their relevance to an understanding of public value. Moreover, these models provide the theoretical basis for the behaviour change agenda - nowadays when people in policy circles talk of behaviour change models, they tend to mean social-psychological models. This literature is synthesised more fully in the accompanying Reference Report which provides full referenced detail on over 60 relevant models, theories and frameworks. Much of the supporting evidence for the models is conceptual, but there is also a more limited empirical evidence base.

In signposting readers through the theoretical and empirical literature, the Practical Guide provides a **framework** for developing interventions based on behavioural models. It also provides detailed support for research analysts and policy makers in the task of selecting appropriate models. To that end it includes tables matching specific behaviours to behavioural models (see Appendix i). In particular, the Guide recommends the use of models which consider behavioural influences that operate at the group or societal levels in conjunction with those that operate at the individual level. It also emphasises that systems thinking approaches are particularly helpful in attempting to address behaviours which have multiple and complex underlying factors. The importance of addressing the wider implications of behaviour change interventions, particularly in terms of equity and ethical issues, is also incorporated in the Guide. The framework highlights the importance of adopting an analytical approach that draws on theory as the basis for assembling relevant empirical evidence. In this way, users of the framework will help build the evidence base



# 1 INTRODUCTION

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for the effectiveness of models in explaining and changing behaviour.

The Guide begins by providing a brief overview of the range of social-psychological models, theories and principles covered in more detail in the Reference Report, followed by a discussion of the key considerations when using behavioural models to design interventions. This sets the scene for the Nine Principles on the use of models in the intervention development process.

# 2

## Overview of models, theories and frameworks

This review of behaviour change theory observes a distinction between **models of behaviour** and **theories of change**. Models of behaviour help us to understand specific behaviours, by identifying the underlying factors which influence them. By contrast, theories of change show how behaviours change over time, and can be changed. The two bodies of theory are complementary; understanding both is necessary in order to develop effective approaches to behaviour change.

In order to provide an overview of the types of models, theories and frameworks available to those developing interventions the evidence was broken down further. Four types of evidence reviewed are outlined:

- Models of behaviour at the individual level
- Models of behaviour at higher levels of scale
- Theories of change
- Applied models and frameworks

In addition some of the key features of behavioural models are discussed.

### i) **Models of behaviour at the individual level**

Models relating to the behaviour of individuals are predominantly drawn from psychology and sociology, the disciplines which are most concerned with understanding the factors influencing human behaviour. These models build upon standard economic theory which uses the working assumption that individuals tend to behave rationally, with the aim of maximising the benefit to themselves (in psychological terms, such models are 'expected utility' models). Economic theory provides the basis for considerations of human behaviour (especially those behaviours featuring a choice based on costs and benefits). This body of theory has subsequently been extended to account for the limitations in human decision making. The resulting discipline of behavioural economics presents numerous principles to account for less rational behavioural choices (see eg. Dawney and Shah 2005). In so doing, standard economic theory draws closer to the perspectives offered by psychology. (The views of human behaviour offered by economic theory and behavioural economics are outlined further in Section 2 of the Reference Report.)

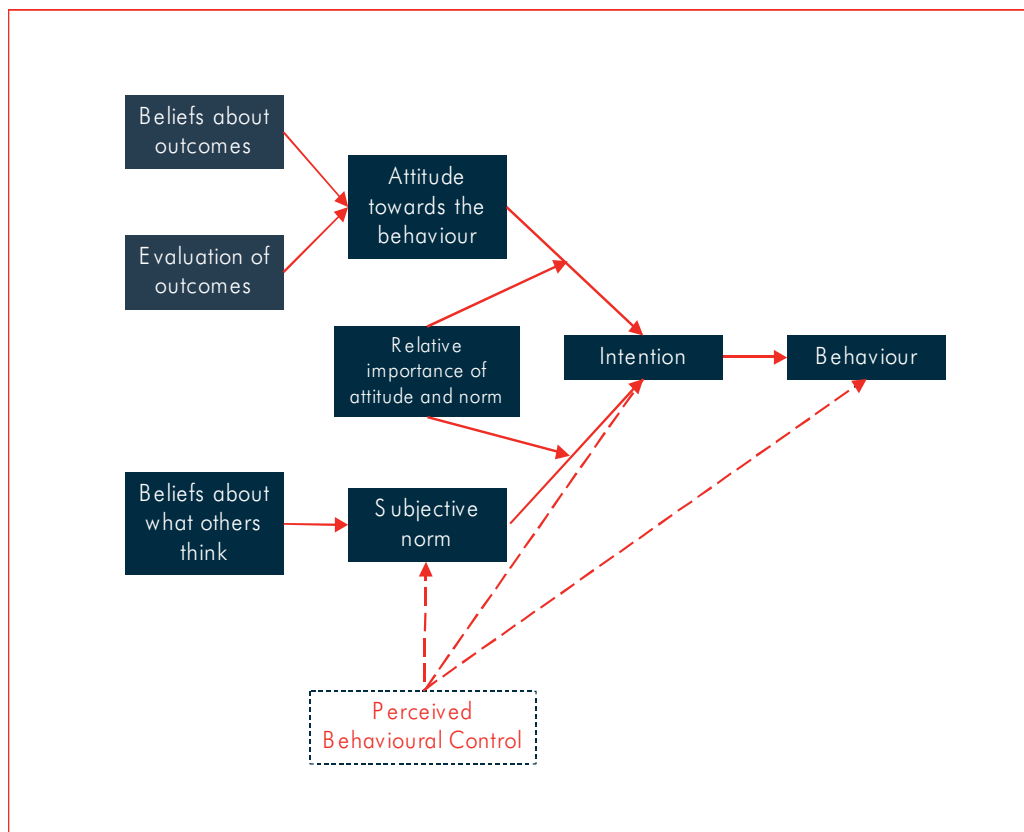
Most social-psychological models are consistent with standard economic theory by presenting behaviour as a decision making process. Most of these models are also consequentialist, assuming behaviour to involve planning ahead, based on outcome expectations (see e.g. Loewenstein et al 2001).

Models of individual behaviour tend to be linear, or multilinear, in shape and the simplest follow rational choice theory, which assumes that individuals perform cost/benefit calculations and act accordingly. Social-psychological models of behaviour go beyond standard economic theory by investigating the origins of behavioural preferences. The resulting models thus incorporate a wider range of influencing factors. However, at their core these models present behaviour as the product of a deliberative process (based on intention, and expected outcomes). In this way social-psychological approaches to understanding behaviour can be seen as building upon standard economic theory.

## 2 OVERVIEW OF MODELS THEORIES AND FRAMEWORKS

The essential factor in most social-psychological models is **attitudes**, which tend to be conceived as the product of a deliberative calculation weighing an individual's beliefs about a behaviour with the value they attach to those characteristics (these are 'expectancy value' models - see eg. Jackson 2005). Over time, the models have developed further (becoming 'adjusted expectancy value' models), building in additional factors to explain behavioural outcomes. These in turn diminish the primacy of attitudes in determining behaviour. Most social-psychological models remain intention-based; the most well-known example is **Ajzen's Theory of Planned Behaviour (TPB)** (1986, in Ajzen 1991 – see Figure 1 below). An alternative is offered by **Triandis' Theory of Interpersonal Behaviour (TIB)** (in Triandis 1977); this model allows for less deliberative behaviours by including **habit**, which can bypass intentions to determine behavioural outcomes directly.

Figure 1: Ajzen's Theory of Planned Behaviour (TPB), (1986)



It is important here to give definitions of some of the key factors which feature in models of individual behaviour, if only to provide ready references for the tables supplied in Appendix i. It may be noted that while **attitudes**, **norms** and **agency** are common to most models, **habit** and **emotion** only appear in some (eg. the TIB and not the TPB). Looking at Table A1 matching models and factors to specific behaviours, it can be noted that many of the factors highlighted as being important are not featured in the TPB – despite its being the most widely-used model in approaches to behaviour change.

- **Attitudes**

As mentioned above, attitudes tend to be conceived as the product of our beliefs about a behaviour (or object), combined with the value we attach to those beliefs. While the origins of attitudes (as preferences) are not addressed in standard economic theory, the attitude

formation process in psychology is presented as a deliberative calculation, following rational choice lines. It should be noted however that several other models highlight the role of emotions in generating attitudes (eg. the Risk as Feelings model (Loewenstein et al 2001), and Petty and Cacioppo's Elaboration Likelihood Model, in eg. Bagozzi et al 2002). Technically, attitudes are defined as being specific to a behaviour (or object); in contrast, beliefs are more generic, relating to a wider worldview. Values represent a still higher level of innate preference (see eg. Stern et al 1995).

- **Norms**

Social norms appear in the TPB as 'subjective norms', defined as a person's "perception that most people who are important to him think he should or should not perform the behaviour in question" (Ajzen and Fishbein 1980, in Jackson 2005). Social norms act as a guide to how we should behave, and how we expect others to behave. Cialdini makes the important distinction between two types of social norms: 'descriptive norms' which specify what is done, based on the observation of the majority of others, and 'injunctive norms' which specify what other people think ought to be done (Cialdini et al 1990). As well as social norms, theory also identifies personal norms; these internalised norms are felt as a sense of moral responsibility to help others (eg. Schwartz 1977). Personal norms are particularly useful in accounting for pro-environmental behaviour (eg. Thøgersen 2007). Theories of identity relate closely to norms: social identity defining who we are by reference to others (including the concept of in-groups and out-groups – see Turner and Tajfel 1979 in e.g. Terry et al 2000), and self identity relating to our concept of who we are, which is subject to ongoing negotiation (see eg. Jackson 2005).

- **Agency**

The concept of agency appears in most social-psychological models, but in a variety of different guises. Agency can be broadly defined as an individual's sense that they can carry out an action successfully, and that that action will help bring about the expected outcome. Self efficacy is the most widely used version of the concept of agency, defined by Bandura as "the conviction that one can successfully execute the behaviour required to produce the outcomes" (Bandura 1977). Agency appears in the TPB as Perceived Behavioural Control (PBC), a construct which is heavily based on self efficacy. Agency is important in influencing behaviour as it determines how much effort we will put in, or whether we will attempt the behaviour at all.

- **Habit**

Paul Stern describes habit as an individual's "standard operating procedure" (Stern 2000). Most frequent behaviours which are undertaken at "low levels of consciousness" (ibid.) have a large habitual component (for example, turning out the lights in unused rooms). Whereas the TPB holds beliefs as the "underlying foundations" of behaviour (Ajzen 1991), habit is seen as the primary determinant in the TIB (Triandis 1977). Triandis defines habit as "situation-behaviour sequences that are or have become automatic..." (1980, in Bamberg and Schmidt 2003). It is the automatic element of habit that differentiates it from repeated behaviour.

- **Emotion**

Emotion is included in the TIB as the concept of 'affect' (Triandis 1977). Behavioural intentions in the TIB are generated via two paths: cold cognition (the expectancy value construct) and hot evaluation (the affect factor, or emotional response) (see Bamberg and Schmidt 2003). The inclusion of affect as a unique factor in the TIB is relatively unusual as most social-psychological models embed emotions within other components. For instance, the Risk as Feelings model shows emotion to contribute to the process of attitude formation (the 'affect as information' hypothesis – see Loewenstein et al 2001). However, in that model, 'feelings' can also follow a direct path to behaviour (side-stepping intentions); fear offers a good example of such an overpowering emotion. Emotions also influence intentions directly, as 'anticipatory emotions' which inform individuals' analysis of the cost/benefits of acting, based on how they would feel if they were to succeed or fail at the behaviour in question (see eg. Bagozzi et al 2002).

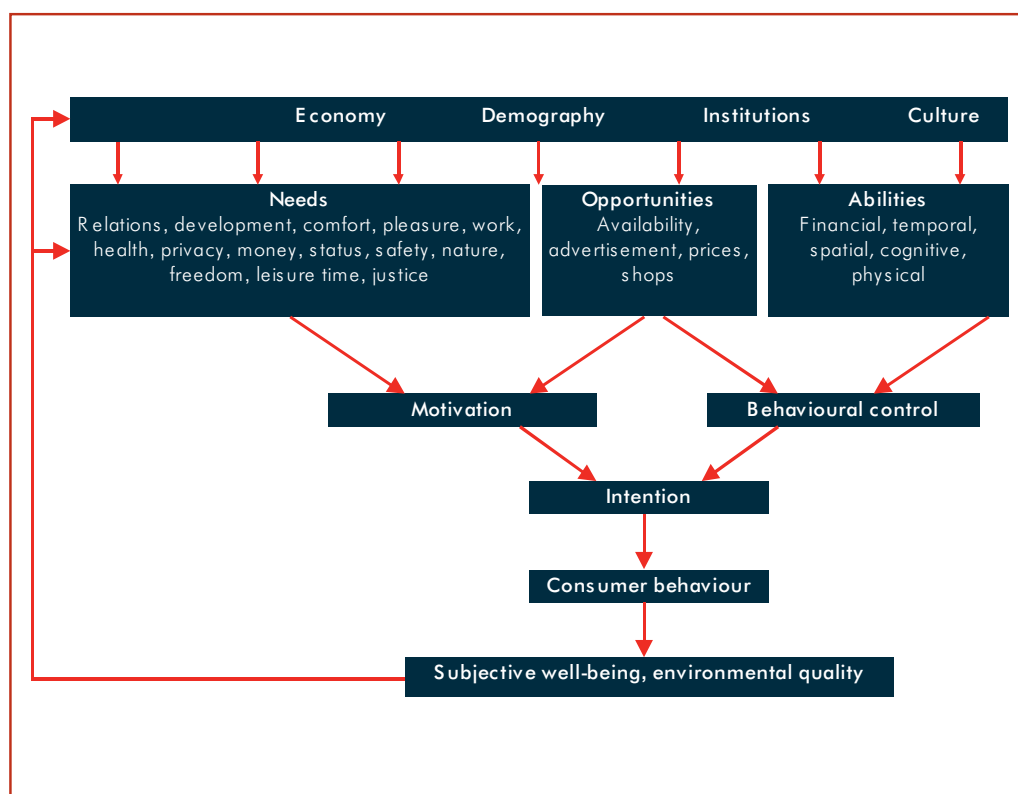
- **Contextual Factors**

Contextual factors can be defined as "factors beyond an individual's control" (Stern 2000), such as access to information or resources (be that money, time or transport, etc). As such, these external factors are usually left off social-psychological models, which only plot influencing factors which are situated in an individual's psyche. However, most models account for these contextual factors by incorporating them within the agency construct (eg. Perceived Behavioural Control is a measure of individuals' perceptions of how much enabling factors are beyond their control – see Ajzen 1991). The TIB features contextual factors in the construct 'facilitating conditions'; these are not simply external factors, but include a person's ability to act, their state of arousal (eg. hunger) and their knowledge of the behaviour. Contextual factors such as cost and the availability of information can be important in determining behaviour, but it should be noted these are not simply external, but also depend on how an individual perceives them.

- ii) **Models of behaviour at higher levels of scale**

While most social-psychological models are concerned with the factors influencing behaviour from within an individual's own psyche, some models include factors shaping individual behaviour from higher levels of scale. The forces shown in these models include macro-level societal factors, for instance technology and the economy. Thus these may be called '**societal' models**. These models are important to those developing policy as often it is necessary to work on the contextual factors limiting behavioural options directly; simply changing a person's perceptions of these material factors (eg. cost) will not be sufficient to enable change.

Figure 2: Vlek et al's Needs Opportunities Abilities (NOA) Model, (1997)



Examples of ‘societal’ models include the **Main Determinants of Health model** (Dahlgren and Whitehead 1991) which shows the individual’s behaviour as one element, beneath four other ‘tiers’ of influencing factors. **The NOA (Needs Opportunities and Abilities)** model of consumer behaviour similarly shows the influence of societal factors on individual behaviour (1997, in Gatersleben and Vlek 1998 – see Figure 2 above). This nested model incorporates a social-psychological model of individual consumer behaviour at its centre, subject to five macro-level societal factors shaping individual behaviour from above. Notably, the model also shows consumer behaviour influencing the societal factors, by means of a large feedback loop running from the bottom of the model to the top.

### iii) Theories of change

Theories and approaches derived from work in the social sciences can help us to understand processes of change. These theories are vital to those developing interventions, as it is not enough simply to understand why behaviours happen, when the challenge is to make behaviour happen differently.

Types of theories of change identified as part of the review include:

- **Lewin’s Change Theory**

Social-psychologist Kurt Lewin’s work on change has provided the basis for many subsequent approaches (Lewin 1951). **Lewin’s Change Theory** involves group work to change habitual behaviours, using an unfreezing/refreezing dynamic in which habitual behaviours are lifted up to scrutiny by the group and reconfigured, before being left to fall back into everyday routines.

- **Diffusion Models**

Models of diffusion can be used to show how a behaviour spreads through a society or network. **Rogers' Diffusion of Innovations theory** is the best known example, although it is most commonly applied to the adoption of technologies, rather than social behaviours (see Rogers 1995).

- **Staged Models**

Staged models of change describe change as a process, broken down into a series of stages through which individuals progress. The best known example is **Prochaska and Di Clemente's Transtheoretical ('Stages of Change') Model**, originally developed in the context of smoking cessation (see Prochaska and Velicer 1997). In the light of recent criticism from practitioners, the Model appears more useful for its conceptual lessons than its practical applications.

- **Learning-based Models**

Learning theory going back to the educationalist John Dewey sees learning and change as dual elements in a single process. The theory of double loop learning extends this thinking on learning through doing to allow for both incremental and transformational change (see Argyris and Schon 1996).

- **Organisational Learning Models**

Practical approaches to organisational change build on learning theory to show how transformational change requires the revealing and refashioning of underlying assumptions (see eg. Schein 2004, Scharmer 2007).

- **Systems Thinking Approaches**

Systems thinking emerged from the disciplines of engineering and cybernetics; systems thinking regards behaviour as the product of interactions between the parts of a whole system. As an approach to change, systems thinking is best described as "a discipline for seeing wholes" (Senge 1990).

#### iv) **Applied models and frameworks**

The review identifies a number of process-based models and frameworks which have been applied to policy making for behaviour change.

**Social marketing**, defined by the National Centre for Social Marketing as a process for delivering behaviour change for the public good, is characterised by understanding audiences and interventions through ongoing research (see French and Blair Stevens 2005). It also calls for multiple instruments to be combined in an intervention mix.

Social marketing provides step-by-step guidance for developing interventions. This guidance is consistent with more specific frameworks such as Gardner and Stern's '**Principles for Intervening to Change Environmentally Destructive Behaviour**' (in the context of the environment - 1996, in Stern 2000) and **Intervention Mapping (IM)** (for health programmes – Bartholomew et al 1998). Such frameworks set out theory- and evidence-based approaches to designing, developing and evaluating interventions.

**Defra's 4Es model** builds on social marketing, and offers a checklist for policy makers to help ensure that they use a balanced 'package of measures' to achieve their behaviour change objective (2005, in eg. Defra 2008). The 4Es themselves represent different approaches to policy making for behaviour change (Enable, Encourage, Engage and Exemplify). Against each E, potential policy interventions are specified (for example, Enable includes remove barriers, give information, and provide facilities). The 4Es model has been adapted and used across government; it notably features within a new model of policy making for culture change developed by the Prime Minister's Strategy Unit (Knott et al 2008). That culture change model adopts a nested approach to individual change, reminiscent of societal models such as NOA, discussed above.

Finally, Jake Chapman offers a challenge to traditional models of policy making, which he describes as operating along 'mechanistic' lines, based on the principles of 'command and control'. Rather than targets being imposed on service deliverers from the centre, Chapman advocates the application of a **systems thinking approach** which ultimately aims to create a system of government which can learn for itself, and is thereby able to tackle complex problems, and avoid ongoing policy failure (Chapman 2004).





# 3

## Making use of models

This section provides an overview of some of the factors that should be considered when using behavioural models to develop behaviour change interventions.

### Limits of behavioural models

While this review advocates that intervention strategies should be grounded in theory, it is important to stress that there are limits to what behavioural models can tell those who are developing interventions. The distinction in this review between behavioural models and theories of change is made primarily to emphasise that adopting models alone is insufficient to bring about behavioural change; an understanding of the process of change must also be applied. The evidence in this review is clear that a behavioural model should not simply be taken up and used as the basis for a behaviour change intervention without first considering a range of issues (see Reference Report, Section 3, for a more in-depth discussion).

These include:

- **Models are concepts, not representations of behaviour**

They show the factors influencing behaviour, but do not explain the processes for changing behaviour.

- **Behaviour is complex, but models are deliberately simple**

They are concepts to aid understanding – they are deliberately simplistic and do not capture all the factors that account for behavioural outcomes.

- **There is a limit to how far models will stretch**

They are developed in the context of a specific behaviour, and tend to work best in that context – although some do have wider applicability.

- **Models don't tend to differentiate between people**

They tend to show the behaviour of a statistical 'everyman' – and need to be adapted in order to cover different audience groups.

- **Factors don't always precede behaviour**

Most behavioural models present social-psychological factors as preceding behaviour but there are instances where people are compelled to change their behaviour first, which then leads to change in the social-psychological variables.

- **Factors are not barriers**

Behavioural models can appear to present factors as buttons to be pressed, in the expectation that the behavioural outcome shown will result. This is a misleading interpretation, not only because other factors which are 'off the model' may also need to be accounted for, but because the mechanistic assumptions underpinning such a view are inadequate to explain the nature of change, and to support individuals in that process.

The review of theories of change also identifies a number of procedural limits to using behavioural models in aiming to bring about behaviour change. At a basic level, theories of change stress that interventions must look beyond the individual to address the **context** within which they function (their 'social field' (Lewin 1951), or 'system of interest' (Chapman 2003)). Procedurally, the principles of **action research** as deployed in diverse methods show that engaging actors in the process is the best way to bring about change amongst them (see eg. Stern 2000, Hobson 2001). In addition, **systems thinking** approaches have put forward fundamental objections to interventions based on models. Senge (1990), for example in the context of organisational change objects to the adoption of models because their use cannot deliver the transformational change required to remedy complex problems. Systems thinking can best be understood as a discipline for understanding complex problems; the process of analysing the problem itself reveals opportunities for interventions. Systems thinking thus offers an approach based on modelling complex behaviours, rather than advocating the use of existing models. Applying systems thinking to policy problems, Jake Chapman calls for the refashioning of government as a learning organisation (Chapman 2004). He objects to the use of predetermined principles in developing interventions on the grounds that, in appearing to offer solutions, their use blocks further learning among those who adopt them. The same criticism could be applied to the adoption of models at face value.

### Using models effectively

This review does not conclude, as systems thinking approaches do, that models should not be used in developing behaviour change interventions. Instead it proposes a process in which the analytical strengths of behavioural models are joined up with approaches to policy development and delivery based on the principles of action research. The development process should involve the active participation of audience groups, and the refinement of the intervention through piloting on the ground. The Nine Principles framework resulting from this review is built around using behavioural models. However, it is essential that those models are used appropriately: not as templates for behaviour change policies, but as **tools** to be used in the design of those interventions. In all instances, analysts and policy makers should use models as **aids to thinking**, and not seek to impose them on the public uncritically through interventions.

In his authoritative review of theories and models of behaviour in relation to sustainable consumption, Tim Jackson identifies two purposes for behavioural models (Jackson 2005). One is '**heuristic**', in which models serve to help us understand the factors influencing behaviour and how they interrelate. The other purpose is '**empirical**', to quantify the relationships between the factors to allow us to predict the behavioural outcomes. Triandis adopts a similar approach, saying that a good model is one which predicts a specific behaviour well (Triandis 1977). However this point does not override the inherent nature

of models as concepts. At the end of presenting the TIB, Triandis (quoting Cronbach 1975), says that models are "...concepts that will help people use their heads". Predicting outcomes with models advances our understanding, and shows which model is more appropriate for understanding a given behaviour. However models fundamentally do not determine how people behave.

While models can't account for all the complexities of behaviour and determine how people behave, they can help to identify some of the factors that influence those outcomes. As Tim Jackson writes: "models reveal factors where policy can work" (Jackson 2005). In such an approach, models essentially offer a menu of factors for policy makers to choose from (rather than a 'recipe' for creating behaviour). Behavioural models can be used in the initial design phase to help identify those factors that may be worked upon in the intervention. In turn, the interventions can be evaluated in terms of impact on those target variables, as well as in terms of change in the end behaviour itself. An example of this is the evaluation of the impacts of an HIV prevention programme based on the Information-Motivation-Behavioural Skills (IMB) model (Fisher et al 2002). The programme's effectiveness was judged against each of the three factors (ie. knowledge, attitudes, and skills/agency), as well as in terms of the overall impact on safe sex behaviour.

An example of a model-based approach to intervention development can be found in work on the FRANK drugs campaign from the Home Office, DH and DCSF (see Darnton 2005). Recognising reducing levels of drug use to be a complex problem (and one ultimately beyond the reach of information-based campaigns), the FRANK team commissioned desk research, which identified **Gibbons and Gerard's Prototype/Willingness Model** as having potential for use in campaign strategy development (Gibbons et al 2003). One of the objectives for the campaign is to prevent or delay the onset of drug use among 11 to 14 year olds. The Prototype/Willingness Model offered an ideal basis for campaign development as it shows the process through which young people move from initial risky behaviours (based on 'behavioural willingness') through to established risky behaviours (based on 'behavioural intention'). The Model also identified an influential factor on the 'willingness' pathway as 'risk images' (a individual's perceptions of what a typical person undertaking the risky behaviour is like). The 'risk images' factor was highlighted as an appropriate factor for FRANK to work upon, and one which would respond to information-based instruments. Using audience research, campaign elements were developed to alter young people's 'risk images' of people who use different illegal drugs, and the campaign was evaluated against measures of change in young people's 'risk images'.

Clearly, this is a pragmatic approach designed to improve the effectiveness of behaviour change interventions. The fuller answer to tackling complex problems like drug use would at the very least involve policy interventions working at all levels of scale (eg. across the four tiers in the **Main Determinants of Health model** - Dahlgren and Whitehead 1991). It is for this reason that the approach arising from this review recommends the use of behavioural models operating at different levels of scale in conjunction with models of individual behaviour. The method also recommends that systems thinking approaches are used to address the most complex problems, and to build understanding of the role that behaviour change interventions could play in tackling them. But at the centre of the policy planning process, models of behaviour at the individual level can provide policy makers with clues as to where their resources are best deployed, and can help analysts judge how best to evaluate the impacts of those interventions.



# 4

## Nine Principles for developing interventions based on models

This review has drawn a distinction between models of behaviour and theories of change. From a conceptual point of view, this distinction can be quite hard to impose, as the two bodies of theory are closely related, and overlapping in places. However, the distinction becomes clearest in the context of practical guidance, where:

- Models of behaviour help us to understand specific behaviours, by identifying the underlying factors which influence them.
- Theories of change identify intervention techniques which can be effective in bringing about change, as well as suggesting broad approaches to intervention design, implementation and evaluation which can underpin effective policy planning and delivery.

It is important to note that neither body of theory is alone sufficient to generate effective interventions.

Following on from this the Nine Principle framework designed as part of this review, and described below, aims to integrate behavioural models with theoretical understanding of effective approaches to change. The framework provides a starting point for selecting models and developing behaviour change interventions based on this premise.

The framework is expressed in Nine Principles. While these unfold in a logical sequence, they should not be regarded as discrete steps, with one being accomplished before moving on to the next. Instead the Principles can be best understood as a cyclical process, with learning from monitoring and evaluation feeding back in to the development of the intervention. Progress through the Principles is also iterative; learning from work on one Principle could require returning to revisit earlier assumptions. Behavioural models sit at the centre of this cycle. The key factors they identify inform both the initial objectives set for the intervention, and shape the measures against it will ultimately be evaluated. The circular shape of the process is thus consistent with an approach based on the action research principles of 'learning through doing', the intervention being constantly refined as a result of ongoing monitoring and evaluation. Importantly, the cyclical nature of the Nine Principles is also in keeping with existing guidance on policy evaluation, such as the ROAMEF model in the Green Book (HMT 2003), which demonstrates how research can support effective delivery throughout the policy cycle.

The Nine Principles are:

1. **Identify the audience groups and the target behaviour.** If faced with a complex behaviour break it down into its component behaviours and/or adopt a systems thinking approach
2. **Identify relevant behavioural models** (use both individual- and societal-level models). Draw up a shortlist of influencing factors
3. **Select the key influencing factors** to work on Use these to design objectives in a draft strategy for the intervention

## 4 NINE PRINCIPLES FOR DEVELOPING INTERVENTIONS BASED ON MODELS

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4. **Identify effective intervention techniques** which have worked in the past on the influencing factors selected
5. **Engage the target audience for the intervention** in order to understand the target behaviour and the factors influencing it from their perspective
6. **Develop a prototype intervention** based on the learning from working with the actors. Cross-check this against appropriate policy frameworks and assessment tools
7. **Pilot** the intervention and monitor continuously
8. **Evaluate** impacts and processes
9. **Feedback** learning from the evaluation

The Nine Principles resemble existing theory-based guidance for planning interventions, but aim to achieve a synthesis between the different approaches. The key difference between the Nine Principles and other approaches such as social marketing and Gardner and Stern's Principles (in Stern 2000) is the building of behavioural models into the heart of the developing process. The Nine Principles can also be compared to the Intervention Mapping (IM) framework, which similarly centres on behavioural models, but which follows a more programmatic path to intervention development and implementation (Bartholomew et al 1998). The IM approach proceeds through five steps (following an initial Needs Assessment stage), with each step generating a plan or matrix which becomes the basis of the next step. Despite the somewhat mechanistic method of IM, it represents a "problem-based" approach to using models, starting from the audience and the behaviour in question. Overall, the Nine Principle framework proposed here takes account of the need for **flexibility** in developing interventions.

The remainder of this report provides detailed advice on using each of the principles; an emphasis is placed on the earlier principles, in which the use of models and theories is most fundamental. As yet there is limited empirical evidence to underpin guidance on the latter stages of implementation and guidance. However, they are included here as more general principles, in recognition of the theoretical evidence which calls for flexible approaches to changing behaviour, with interventions being refined through piloting and monitoring (see eg. Knott et al 2008, Chapman 2004, Plsek 2003).

### 4.1 Principle 1: Identifying the audience groups and the target behaviour

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Before setting out to develop a behaviour change intervention it is necessary to be clear about whose behaviour is to change, and which specific behaviour is to be targeted. Understanding both 'actors' and 'actions' is essential to designing effective interventions; imprecision on either aspect can lead to blanket approaches being adopted.

It is standard practice in marketing to differentiate between audience groups, recognising that there is seldom a 'one size fits all' solution. Social marketing goes further by putting the 'customer' at the centre of the campaign development process, and starting from the

point of their current behaviour (see eg. French and Blair Stevens 2005). Social marketing's preference for developing audience segmentation models is a result of this approach. The Nine Principles framework proposed here takes a slightly different view; by putting behavioural models (not audience segmentations) at the centre of the development process, understanding the behaviour comes before engaging the audience (see Principle 5 below). Nonetheless, both activities are essential to successful interventions, whether a customer-centred or model-based method is preferred.

Alongside identifying the audience groups, the intervention design process must begin by specifying the behaviour to be changed. This is fundamental to designing effective interventions, whether or not they are based on behavioural models; however, the task of model selection particularly requires clarity about the target behaviour. Existing guidance on developing interventions prioritises this task; see for example Gardner and Stern (1996, in Stern 2000) and McKenzie Mohr's first step in his four stage process of community-based social marketing (McKenzie Mohr 2000). This principle may seem self-evident, but it is often the case that policies are unclear what their ultimate outcome should be. In her review of theory for DWP, Clare Talbot notes that employment interventions commonly set measures on the numbers of people in work (the outcome) rather than the numbers seeking work (the target behaviour) (Talbot et al 2007). Such a lack of clarity not only handicaps research analysts in the evaluation phase, but works against effectiveness throughout the lifecycle of interventions.

If a policy problem is complex, identifying the specific target behaviour may be more difficult. As discussed above, the most complex problems (or 'messes' in systems terminology) will require systems thinking approaches; they are likely to include numerous behaviours among the interactions between their components. As "a discipline for seeing wholes", systems thinking allows those addressing policy problems to stand back and see the patterns at play across the whole (see Senge 2000).

The Foresight programme's recent project on Tackling Obesities provides an example of a systems thinking approach to a complex problem (Foresight 2007). Finding no existing model of obesity which covered all the influencing factors, the project team assembled a group of experts to conduct a systems mapping exercise. The resulting Obesity System Map is a highly complex model of the myriad factors influencing obesity, based around the 'energy balance' model of weight at its centre. The factors are linked together with feedback loops showing the flow of influence between them. The model is conceptual, and the relationships between the factors are not quantified. The Map is notably presented as a starting point in the process of developing potential interventions, and the Map itself is to be refined through ongoing research.

As a result of systems mapping techniques of this kind, it may be concluded that launching a behaviour change intervention is not the appropriate response. For other complex problems, it may be a more simple matter of identifying the multiple behaviours involved, and choosing which ones to tackle first. The evidence from theory suggests that different behaviours are driven by different factors and in different combinations, even if the behaviours appear clearly related. For example, the factors influencing energy efficiency behaviours vary according to the specific measures being taken (see Darnton 2007), while those influencing healthy eating behaviours vary from food to food (see Baker et al 2007). Paul Stern states that each behaviour should be conceptualised differently (Stern 2000).



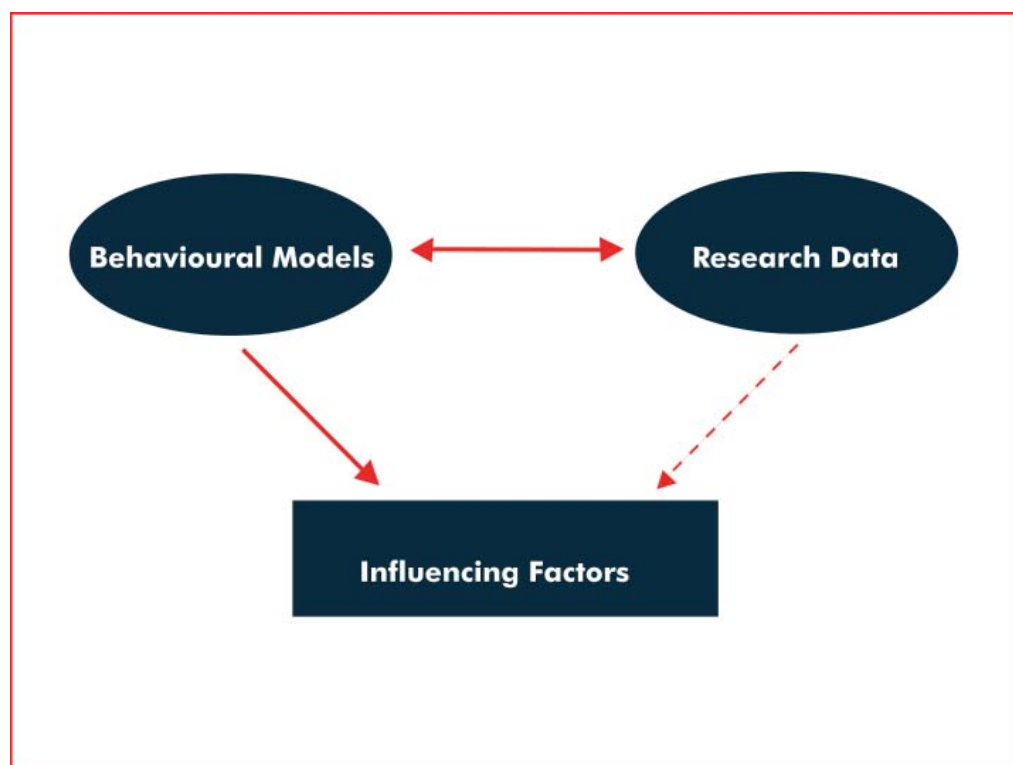
### 4.2 Principle 2: Selecting models

Using behavioural models can help to develop hypotheses for subsequent testing; however, with so many models available, even experienced researchers find it hard to know which one to choose (see eg. Bamberg and Schmidt 2003).

The aim of the model selection exercise in Principle 2 is to identify relevant influencing factors. The outcome of this Principle should be a shortlist of factors which can be carried into Principle 3, in which the key factors will be selected to form the basis of objectives for the intervention. A similar process is laid out in the IM framework, combining theoretical models with empirical data from audience research.

Model selection, and the identification of influencing factors, can be presented as a dual-path approach:

Figure 3: A Method for Identifying Influencing Factors



#### Path 1: From Models to Factors

- Search the existing literature to identify relevant models of the target behaviour, and within them, relevant influencing factors

These models may be specific to the target behaviour (ie. developed to describe that behaviour), or they may be general models (eg. the TPB) which may have been applied to the target behaviour (although this is not essential).

The identification of which models (and which factors within the models) are the most important should be decided statistically. Models should be supplied with empirical data

to show how well they predict the behaviour in question, and which factors are the most effective in doing so. Technically, this involves comparing the level of variance in the end behaviour accounted for by different models (and the factors within them)<sup>1</sup>. It will often be the case that, although empirical data may be supplied to show the relative weights of each of the factors in influencing the end behaviour, the behaviour or target groups in the model differ somewhat from that which is being targeted in the intervention. In such cases, analysts may need to content themselves with using comparable data as an approximation for their target behaviour. Such proxy data should still enable analysts to identify the likely relative importance of the influencing factors, and build a hypothesis about which are the most important to work on. The alternative would be to construct a new model specific to the target behaviour, ideally with data from the audience groups in question. Real limits (of time and money) will often prevent such a step being undertaken, and necessitate the use of proxy data (where it exists).

In cases where models are solely conceptual, and not accompanied by empirical data, intervention developers can either undertake audience research of their own to quantify the impact of the variables, or they can look to existing research data to gather evidence which supports the case for an influencing factor being considered relevant.

#### Path 2: From Research Data to Models and Factors

*-Search existing audience research data to identify reported barriers and drivers, and compare these with models to identify influencing factors*

Research evidence is essential to build understanding of a target behaviour. Research data can work in tandem with theoretical understanding by providing specificity to complement models' more generic conceptual strengths. Research data should ideally be specific to the audience groups in question, and to the target behaviour. Such evidence can be both qualitative and quantitative, and can be used to identify barriers and drivers as reported by the audience. However, these barriers and drivers should not be taken at face value. There is often a difference between what audiences say is influencing their behaviour (especially in response to survey questions), and the factors that underlie those reported barriers and drivers.

For this reason, research findings should be read in combination with models from theory. The research data can confirm which factors on a model are relevant to the audience in question (strengthening the case made by the theoretical evidence), while the models can substantiate and standardise findings from research.

Finally, in many cases research data will identify barriers and drivers that are not featured in theoretical models; often these will be contextual factors (such as access to infrastructure, or cost). It is legitimate to carry these factors forward directly to the shortlist of influencing factors, if they are shown to have a strong influence, despite their not being explicitly featured in relevant behavioural models. These factors are most useful if combined with models of behaviour at higher levels of scale, such as the **NOA model** (Gatersleben and Vlek 1998) or the **Main Determinants of Health** (Dahlgren and Whitehead 1991). Again, audience research data can fill in gaps in the conceptual models, and together

<sup>1</sup>(A level of 20% has been shown to be sufficient to bring about change in the end behaviour of a significant proportion of the target audience see eg. Rosenthal and Rubin 1982, Armitage and Conner 2001. The TPB has been found to account for 40% of the variance in outcomes across a range of behaviours, and this can be taken as strong evidence of its ability to support behaviour change in various contexts – see Aiken 2002 in Talbot et al 2007.)

## 4 NINE PRINCIPLES FOR DEVELOPING INTERVENTIONS BASED ON MODELS

identify influencing factors which should be shortlisted. Above all it should be stressed that the aim of this exercise is not to find one 'winning' model, but to identify a range of models which can provide a shortlist of factors known to be influential in determining the behaviour.

In order to help analysts and policy makers with the process of model selection, this review includes two tables, mapping behaviours against theories (see Appendix i). It should be stressed these tables do not provide solutions to the problem of selecting models; that process is inherently of value in building understanding. Instead these tables are designed to provide suggestions of likely models for analysts to begin with. Further information about all the models listed can be found in the Reference Report.

**Table A1** matches behavioural models to specific behaviours, based on references made in the sources in this review and also includes factors identified in the sources as influencing specific behaviours. Note that these matches are not quantified; a match simply means that a source has identified a link between a behaviour and a model or factor. The Table is thus a starting point in the process of model selection and factor identification (it effectively sits at the start of Path 1 in the method above). Intervention developers should proceed by investigating the supporting evidence for each model or factor, to assess which are the relevant influencing variables. In some cases, the sources which referenced the match will also supply the empirical evidence for the link; in others, the supporting evidence is not made explicit. Finally, it will be noted that for some behaviours, multiple models and factors are identified; it is up to analysts to determine which of these factors and models are the most relevant for the target behaviour and audiences in question.

**Table A2** matches behavioural models to the types of behaviour they are effective at describing. For example, **Norm Activation Theory** (Schwartz 1977) was developed to account for altruistic (helping) behaviours. Table A2 is intended to act as a source of additional models to those in Table A1, and to provide possible starting points where Table A1 does not give a match for the specific behaviour an intervention is targeting. Table A2 effectively sits on Path 2 in the method above. Analysts must first build a thorough understanding of the target behaviour based on research data, in order to conceptualise it into one of the types of behaviour listed (eg. to see it as altruistic, or habitual etc). Once a specific model has been identified, the strength of its influencing factors will need to be investigated using the factor identification method described above.

As Figure 3 shows, the end point of the Model Selection stage is the identification of a shortlist of influencing variables, all of which should be supported by empirical evidence. In the IM framework, these factors should be combined into "a final, plausible and empirically-supported causal model" (Bartholomew et al 1998). While the generation of a new causal model may be an ideal situation it is not essential to the subsequent stages of intervention development as it is likely to be adequate simply to evaluate the intervention against the key factors selected, while at the same time measuring change in the target behaviour itself.

Importantly, if a single model were generated, it would most likely need to be adapted for use with different audience groups. As has been noted (in Section 3) above, social-psychological models tend to be undifferentiated, showing the behaviour of an 'everyman'. Such models must be adapted to relate to specific audience groups if they are to be taken up for use in interventions. The Obesity System Map provides a case in point, having already been adapted for specific reference to children (see Foresight 2007). The importance of using differentiated models is underlined by work for Defra on pro-environmental

behaviours, in which models were produced for the same behaviour across four different segments of the public (Barr et al 2005). The resulting models show clearly how, even for the same behaviour, different factors are present for different segments, and that they impact at different levels.

If a new model is not generated, empirical data, or suitable proxies, will be needed to support each of the key influencing factors to provide baselines against which to evaluate the intervention's impact at the end of the delivery cycle. Again, comparison can be made to the Foresight project on Tackling Obesities: the systems mapping exercise generated a new model, but it was not quantified. Instead, the relative weighting of the influencing factors was judged qualitatively (on a scale of 1 to 5, with the feedback loops shown using different widths of arrows).

Finally, whatever method is used to identify relevant behavioural models, it should be reiterated that these models of behaviour at the individual level will need to be supplemented by models at a higher level of scale. In this way analysts can be sure not to overlook contextual and societal factors influencing the target behaviour. Selecting these models is a much easier task; the review only features two such models of general relevance (**NOA** and the **Main Determinants of Health**), both of which may be useful in identifying key external factors. Note that these models are conceptual in nature; they do not include empirical data (nor would it be obvious how to fill them with data in their current formats). These models should be used alongside existing research data from the audience groups to establish the relative importance of the higher-level factors in influencing the target behaviour.

### 4.3 Principle 3: Designing a draft strategy

The process of model selection will have resulted in a shortlist of influencing factors, each supported by data to show their relative impact on the target behaviour. As part of Principle 3, key factors must be selected from this shortlist to form the basis of the objectives in the draft strategy for the intervention. The process of drafting the strategy is best undertaken by analysts and policy makers together, as the decision on which factors to work on is not simply a statistical question. Often it will not be deemed feasible to target the strongest influencing factors. For example, external barriers (such as cost) may be beyond the intervention developer's control, or it may be that the available intervention instruments (eg. information and communications) do not allow for certain factors to be addressed.

The objectives set for an intervention must be appropriate and achievable. The task of selecting key factors is both analytical and pragmatic; the solution is not found in theoretical models themselves. This is a further reason why a more flexible framework for intervention development is required.

### 4.4 Principle 4: Identifying intervention techniques

Having selected the key factors on which to design the intervention strategy, the next step is to develop the elements of the intervention itself.

While interventions should be shaped in collaboration with the audience, and in the context in which they will be applied, lessons can be learned from analysis of what has worked in existing interventions. Such an analysis is the topic for a separate study, although a little evidence of this sort is provided in the sources reviewed here. Most obviously, **Prochaska and Di Clemente's Transtheoretical Model** includes 'stage-matched interventions' (see Prochaska and Velicer 1997). Social marketing also includes an element of matching intervention methods to desirable outcomes, as shown in Rothschild's Grid applying 'education' (as information), 'marketing' (as incentives), and 'law' (legislation) tools to the target factors of motivation, opportunity and ability (see eg. Kurani and Turrentine 2002). At a greater level of specificity, Fisher et al's work on HIV prevention programmes based on the **IMB (Information, Motivation, Behavioural Skills) model** also identifies techniques known to be effective in changing motivations and attitudes, as well as building self efficacy (Fisher et al 2002).

Most helpful of all is Charles Abraham and Susan Michie's recent work in developing a typology of '**Behaviour Change Techniques**' (BCTs), which are specific intervention methods identified through a meta-analysis of research findings from 195 healthy eating and physical activity interventions (Abraham and Michie 2007). As well as identifying the BCTs as elements of effective interventions, the study maps each technique against theoretical models which have been used to account for the impact of that technique in research (eg. 'providing information about others' approval' is matched to the **Theory of Reasoned Action, the TPB** and the **IMB Model**). Abraham and Michie are explicit that the purpose of their taxonomy is to help those delivering interventions to make the link back to theory, in order that they may evaluate the intervention appropriately, and to facilitate the replication of the intervention in another context. In so doing they echo the NICE guidance (to which Abraham contributed) which calls for the retrospective use of models to identify "the underlying theories linking actions and outcomes" (NICE 2007). While the priority given to behavioural models varies, this review is in agreement that interventions should be informed by theory and developed on the ground, rather than be imposed based simply on the uncritical adoption of a model.

### 4.5 Principle 5: Engaging the audience as actors

Policy frameworks and sets of practical guidance agree that engaging the audience in the process of policy development is essential to achieving effective interventions. At the same time, audience engagement exercises are seen to build fairness ('procedural equity') into the policy process (see eg. Pearce 2007, Knott et al 2008).

In staged guidance, engaging the audience usually features upfront, alongside specifying the target behaviour. However, the Nine Principle framework proposed here has recognised that identifying the different audience groups to be engaged is the starting point for designing interventions, at the same time as specifying the target behaviour. These two activities cannot very well be separated, as understanding behaviour involves understanding the population whose behaviour it is. However, in order to allow for the development of an intervention strategy based on theoretical models, and informed by existing research findings, the task of engaging audience groups is put later on in the Nine Principle process. Effectively this allows a draft strategy to be developed based on theory, before taking it out to test and refine with the audience groups in question.

The other model-based framework, **Intervention Mapping**, adopts a similar method (Bartholomew et al 1998). “Identifying the at-risk population” is the first task within the initial Needs Assessment phase. The IM framework also recommends building a ‘linkage system’ between programme developers, implementers, and adopters (i.e. the audience, as actors). This linkage system is only introduced late on in the development process (at Principle 4), although the author notes it would be beneficial to have the links in place at the start of the intervention planning. While theoretical evidence and research data should be considered first, collaboration with actors should be sought from that point.

In the development stages proposed here in the Nine Principles, audience engagement would initially serve the purpose of testing the assumptions made about the target behaviour and the intervention techniques to be adopted. Specifically, the initial engagement should include the following activities:

- i. understanding the target behaviour and the factors influencing it from the audience’s perspective;
- ii. testing the draft strategy and the key factors it identifies;
- iii. exploring the potential of the known intervention techniques, and collaboration to work up new intervention elements.

The last of these three activities involves genuine collaboration, rather than audience research, and leads into the delivery stages of prototyping and piloting which follow.

#### 4.6 Principle 6: Developing a prototype intervention

Once the draft strategy for the intervention has been agreed with the audience, and potential intervention elements have been identified, these should be turned into prototypes through collaboration with the target audience of actors themselves. These principles are consistent with action research, and can be found in group-based approaches to change such as Theory U (Scharmer 2007). The prototyping process in Theory U effectively involves turning hypotheses into potential projects which can be taken out into the field and piloted on an experimental basis.

The prototyping exercise should also incorporate assessment of the prospective intervention. This may follow standard policy assessment methods, using tools such as the Impact Assessments, but should foreground wider impacts, including ethical issues and equity effects, and unintended consequences (for a further discussion of these issues see the Reference Report). This review has shown that negative impacts on equity and other side effects do not arise as a consequence of which behavioural model (or models) an intervention is based on - no one model is inherently fairer than another. However the way in which a model is applied through the development of an intervention can affect both the fairness of the final outcomes (‘distributional equity’) and the perceived fairness of the development process (‘procedural equity’ – see eg. Pearce 2007). Such procedural considerations can ultimately determine the acceptability of the intervention among the public.

The policy research evidence also argues for an approach to intervention development based on public engagement. In addition, the prototype assessment phase should not merely be regarded as a means of equity-proofing prospective interventions, but an

opportunity for building public views into the intervention strategy. More fundamentally, interventions which are regarded as unfair are likely to be ineffective, as the public will be disinclined to comply with them (the Fuel Duty Escalator offers an extreme example – see eg. Knott et al 2008). Questions of fairness are inherent in policy making for behaviour change, and consideration should be given to ethical concerns and equity issues from the start of the development cycle (see eg. Lewis 2007). Even where an intervention has been developed in accordance with relevant theoretical and empirical research evidence, it may still be rendered ineffective if it is perceived by the public as unfair.

An effort should also be made to review the intervention in terms of its ‘policy consistency’: whether the audience groups in question are already subject to other interventions working in opposite directions. Inconsistency is to be avoided as when policies in one place work in an opposite direction to policy in another, negative or at least neutralising effects can result (see eg. Knott et al 2008). At the same, policy research has shown that the negative effects of multiple policies tend to fall disproportionately on those already in vulnerable groups.

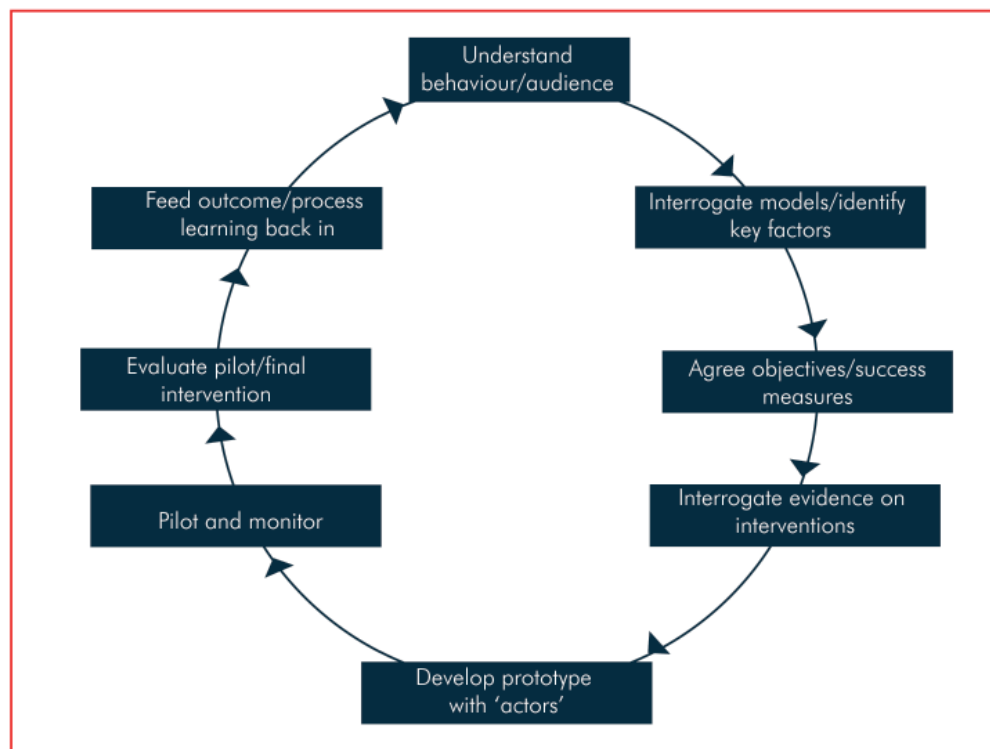
### 4.7 Principles 7 to 9: Piloting, evaluation and feedback

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The last three Principles in the Nine Principle framework – piloting and monitoring, evaluation and feedback - can perhaps be regarded as more advisory than the first six. They are certainly less closely related to the central theme of this review, and the resulting advice on how to use behavioural models. Ultimately, the implementation, monitoring and evaluation of interventions should be conducted in accordance with existing guidance on best practice in policy making and evaluation, as presented in the Magenta Book (GCSRO 2003, updated GSRU 2007) and the ROAMEF model in the Green Book (HMT 2003). However these three Principles are included in recognition of the strong case made by the theoretical evidence – particularly that relating to learning theory and systems thinking - for flexible approaches to implementation and evaluation. These calls are echoed in the recent processes and frameworks for policy making for behaviour change included in this review.

The Nine Principles framework has already been described as a cyclical process; the last three principles, focusing on monitoring and evaluation, effectively join up the loop of the intervention cycle, by feeding learning back in to the ongoing policy process. This resulting depiction of the intervention process as a cycle is consistent with theories of change, notably those based on action research, with its ongoing cycles of action and reflection. While these three research-led principles are presented at the end of the sequence of tasks based on behavioural models, it is imperative that they are also considered at the start of the process. As all good practice guidance in research would suggest (and as the ROAMEF model epitomises) objectives and intended outcomes need to be established together at the outset of the policy planning process. In a reinforcing relationship, each informs the other: what is measurable helps to define what targets should be set, and vice versa. The implications of theories of change included in this review only underline these principles of good practice.

Figure 4: The role of research in the Nine Principles framework



The Nine Principles framework proposes that, once through the assessment stage, the prototype intervention should be implemented in a pilot stage (**Principle 7**). Process-based theories of change relating to policy call for piloting as the most effective means of developing effective interventions. The pre-test phase is central to Andreasen’s six stages of social marketing, which then continues in a loop of ongoing monitoring (in Kurani and Turrentine 2002). The PMSU’s paper on policy making for culture change calls for the creating of “safe spaces...to test and trial new ideas and innovations” (Knott et al 2008). Piloting is also fundamental to Jake Chapman’s approach to policy making, in keeping with systems thinking’s endorsement of trial and error methods of innovation (Chapman 2004). Ongoing monitoring should be undertaken in parallel to the pilot activity. As a result of the monitoring the pilot intervention should be adapted, extended or abandoned (see Jowell 2003 for further information on the role of pilots in policy making).

**Principle 8** involves the evaluation of the final intervention, the design of which should be considered at the outset. Evaluations should measure change in the target behaviour among the audience groups in question, as well as impacts on the key influencing factors. Other effects should also be evaluated (potentially using qualitative techniques) in order to build an all-round view of the intervention’s impact which takes in any unintended consequences. As well as assessing impacts, the evaluation should also address the processes used to design, develop and deliver the intervention. In this way, the models and theories used to underpin the intervention may be reassessed in the context of the target behaviour, and understanding of the behaviour itself may be advanced.

**Principle 9** represents the closing phase of the cycle in which learning from the evaluation is fed back into the policy process. In keeping with the balance of the evaluation, learning



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should cover the intervention techniques, their impacts and the process. As part of the process evaluation, the appropriateness of the behavioural models used in the intervention should be assessed. The evaluation findings should inform both the development of the intervention itself and future interventions in similar policy areas.

Since Lewin's field theory, theoretical approaches to change have recommended developing theory through practice. Piloting and evaluation, followed by building learning back in, are the final stages in a process of intervention development which can be characterised as learning through doing. It is notable that the more programmatic Intervention Mapping framework describes the process of intervention development as "iterative", and includes the possibility of returning to previous stages in the process in order to readjust the intervention in the light of subsequent learning. Guidance on policy development needs to be explicit; however, it must also be flexible to different contexts. Perhaps fearing that their framework would be adopted too rigidly, IM's authors wrote that "one of the potential drawbacks of any policy model is that it will be used as a cookbook" (Bartholomew et al 1998).

Mindful of these inherent risks, the Nine Principles proposed here are underpinned by evidence from theory which ultimately suggests that behaviour change is best pursued as a craft not a science. To this end it is also strongly recommended that research analysts and policy makers work together throughout the Nine Principles to minimise the risks of developing inflexible interventions.

# Appendices

## i) Tables: Matching Behaviours to Models

The two tables below are intended to support analysts and policy makers in the process of model selection. The tables summarise all the references made in the sources under review in which a behaviour (or type of behaviour) is linked to a behavioural model (or factor). These matches are indicative; some are supported by empirical data in the sources referenced, and others are not. In all cases the matches they show should be investigated further before selecting a model (or models) for use in designing an intervention strategy.

Table A1: Behaviours matched to models (plus factors), by behaviour domain

[Behaviour]	[Model (or Factor)]	[References]
<b>Community Participation</b>		
Blood Donation	(habit / past behaviour)	Lewis 2007
Community Participation	CLG's Model of Community Empowerment	CLG 2008
Community Participation	(social/cultural norms)	Knott et al 2008
Community Participation	(social capital)	Putnam 2000
Voter Choice	Theory of Reasoned Action	Ajzen 1991
Voter Choice	Clarke et al's Valence Politics Model	Clarke et al 2004
Voter Choice	(habit / past behaviour)	Lewis 2007
Voter Turnout	Theory of Planned Behaviour	Ajzen 1991
Voter Turnout	Whiteley and Seyd's General Incentives Model	Clarke et al 2004
<b>Consumption</b>		
Buying Domestic Appliances	(convenience)	Shove 2003
Consumption	NOA	Gatersleben and Vlek 1998
Consumption	Spaargaren and Van Vliet's Consumption as Social Practices	Jackson 2005; Burgess and Nye 2006
Consumption	(self/social identity)	Shove 2003
Purchasing Choices	(attitudes: automatic)	Maio et al 2007
Shopping	Bagozzi and Warshaw's Theory of Trying	Bagozzi et al 2002
<b>Environment</b>		
Climate Change	(social/cultural norms)	Knott et al 2008
Composting	Taylor and Todd's Theory of Composting as Altruism	Darnton et al 2006
Energy Consumption	(socio-technical regimes)	Shove 2003
Energy Efficiency Behaviours	(contextual factors: information, costs, incentives)	Wilson and Dowlatabadi 2007
Food Choice	Bedford's Environmental Considerations for Food Purchasing	Bedford 2002

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Home Energy Use	(information eg. better billing, smartmeters)	Lewis 2007; Wilson and Dowlatabadi 2007
Pro-Environmental Behaviour	(values: altruism)	Thøgersen and Olander 2006; Berglund and Matti 2006
Pro-Environmental Behaviour	(personal norms)	Thøgersen 2007
Recycling	Barr's Path Analysis Models of Recycling Behaviour	Barr et al 2005
Recycling	Stern's ABC Model	Stern 2000; Jackson 2005
Recycling	(social norms; personal norms inc neutralisation)	Burgess and Nye 2006
Recycling	(contextual factors: infrastructure)	Burgess and Nye 2006
Solar Microgeneration	(social norms: descriptive)	Wilson and Dowlatabadi 2007
Waste Reduction	Barr's Path Analysis Models of Reducing Behaviour	Barr et al 2005
<b>Health</b>		
Addiction (eg. Smoking)	PRIME	West 2006
Alcohol / Drug Use (Giving Up)	Prochaska and Di Clemente's Transtheoretical Model ('Stages of Change')	Prochaska and Velicer 1997
Alcohol Consumption	(contextual factors: cost)	Lewis 2007
Alcohol Consumption	Dahlgren and Whitehead's Main Determinants of Health Model	Dahlgren and Whitehead 2007
Alcohol Consumption (esp. Young People)	(social norms)	Rimal et al 2005
Binge Drinking	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Binge Drinking	(social norms)	Schultz et al 2007
Bottle-feeding Babies	Theory of Reasoned Action	Ajzen 1991
Condom Use	Theory of Planned Behaviour	Ajzen 1991
Condom Use	(self efficacy)	Armitage and Conner 2001
Dental Flossing	Theory of Planned Behaviour	Gibbons et al 2003
Drug Use (esp. Young People)	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Eating Vegetables	Theory of Planned Behaviour	Gibbons et al 2003; Baker et al 2007
Food Choice	Rosenstock's Health Belief Model	Becker et al 1977
Food Choice	(information eg. labelling)	Lewis 2007
Food Choice	(affect: preference/pleasure)	Conner 2007
Food Choice	(contextual factors: cost)	Maio et al 2007
Food Choice	Theory of Planned Behaviour	Maio et al 2007
Obesity	Foresight's Obesity System Map	Foresight 2007

Obesity	Dahlgren and Whitehead's Main Determinants of Health Model	Dahlgren and Whitehead 2007
Obesity	(social/cultural norms)	Knott et al 2008
Positive Health Behaviours	(personal norms)	Maio et al 2007
Preventative Health Behaviours	Rosenstock's Health Belief Model	Becker et al 1977
Public Health Scares (Boycotts)	Loewenstein et al's Risk as Feelings Model	Loewenstein et al 2001
Safe Sex	(affect: anticipatory)	Bagozzi et al 2002
Smoking	Dahlgren and Whitehead's Main Determinants of Health Model	Dahlgren and Whitehead 2007
Smoking	(contextual factors: cost)	Knott et al 2008
Smoking (Giving Up)	Prochaska and Di Clemente's Transtheoretical Model ('Stages of Change')	Prochaska and Velicer 1997
Smoking (Giving Up)	Protection Motivation Theory	Rogers 1975
Smoking (Giving Up)	(self efficacy)	Prochaska and Velicer 1997
Smoking (in Public)	Social Learning Theory (social proof)	Dawnay and Shah 2005
Smoking (in Public)	(social norms: descriptive)	Halpern et al 2003
Taking Exercise	Theory of Planned Behaviour	Ajzen 1991
Tooth Brushing	Protection Motivation Theory	Rogers 1975
Using Contraception	Prochaska and Di Clemente's Transtheoretical Model ('Stages of Change')	Prochaska and Velicer 1997
Using Sunscreen	Prochaska and Di Clemente's 'Stages of Change': decisional balance	Shepherd 2006
Using Sunscreen	(social identity: in-group norms)	Terry et al 2000
<b>Transport</b>		
Car Buying Choice	Lane and Potter's Car Buying Model	Anable et al 2006
Car Use	Theory of Interpersonal Behaviour	Anable et al 2006
Car Use	Bamberg and Schmidt's Model of Car Use	Bamberg and Schmidt 2003
Car Use	(affect)	Anable et al 2006
Car Use	(self identity: symbolic)	Anable et al 2006
Car Use	(habit / convenience)	Lewis 2007
Congestion Charging (Paying)	Festinger's Cognitive Dissonance	Darnton et al 2006; Knott et al 2007
Crossing the Street	Protection Motivation Theory	Rogers 1975
Drink Driving	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Drink Driving	(affect: anticipatory)	Bagozzi et al 2002
Public Transport Use	(personal norms / values)	Anable et al 2006

## APPENDICES

Public Transport Use	(contextual factors: infrastructure)	Lewis 2007
Seatbelt Use	Theory of Planned Behaviour	Gibbons et al 2003
Seatbelt Use	(social norms)	Demos/Green Alliance 2003; Dawnay and Shah 2005
Seatbelt Use	(past behaviour / habit)	Lewis 2007
Speeding	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Speeding	(social norms: descriptive, injunctive)	Jackson 2005
<b>Work &amp; Savings</b>		
Incapacity Benefit (Reducing Claims)	Rosenstock's Health Belief Model	Talbot et al 2007
Pensions / Investments	(inertia)	Talbot et al 2007
<b>Other</b>		
Adultery	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Crime	Halpern's Tripartite Model of Crime	Halpern 2001
Crime	(collective efficacy)	Pearce 2007
Education Retention	(contextual factors: incentives eg. EMAs)	Knott et al 2008
Education Retention	(social/cultural norms)	Knott et al 2008
Littering	Cialdini's Focus Theory of Norms	Cialdini et al 1990
Playing the Lottery (Gambling)	(affect: anticipatory)	Bagozzi et al 2002
Tax Evasion	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003

Table A2: Types of behaviour matched to models

[Type of Behaviour]	[Model]	[Reference]
Addictive (Early Stages)		
	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Addictive (Established)	West's PRIME Theory	West 2006
Altruistic / Helping	Schwartz's Norm Activation Theory	Schwartz 1977; Jackson 2005
Coping (involving Risk)	Rogers' Protection Motivation Theory	Rogers 1975
Delinquent (Inaction)	Sykes and Maza's Norm Neutralization Theory	Burgess and Nye 2006
General - Frequent / Habitual / Low Consciousness	Triandis' Theory of Interpersonal Behaviour	Triandis 1977; Jackson 2005
General – Under Total Volitional Control	Fishbein and Ajzen's Theory of Reasoned Action	Ajzen 1991; Jackson 2005
General – Under Less Total Volitional Control	Ajzen's Theory of Planned Behaviour	Ajzen 1991
Less Appropriate	Gibbons and Gerrard's Prototype/Willingness Model	Gibbons et al 2003
Preventative (inc. Health)	Rosenstock's Health Belief Model	Becker et al 1977
Risky / Emotional	Loewenstein's Risk as Feelings Theory	Loewenstein et al 2001
Visible / Public	Cialdini's Focus Theory of Norms	Cialdini et al 1990

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