Consolidating
Behaviour Change Theory

LSHTM/Hygiene Centre
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Summary

Practitioners wishing to improve behaviour for public health have a huge number of theoretical models from which to choose. Some focus at the individual psychological level, some at the level of the environment, others look at ways of separating target groups for intervention and still others propose processes aimed at designing effective interventions. Each of the approaches has strengths and weaknesses but, as yet, there is no clear evidence as to which provides the best guide to changing behaviour. In the past there have been efforts to gather theories and achieve consensus; however, these have often been uncritical and have been hampered by having no overarching view of behaviour change.

In this review of approaches to behaviour change, we first set out a framework for behaviour change theories which we believe to be simple and complete. Our framework assumes that health is influenced by behaviour, that behaviour is determined by psychological entities or 'constructs' in the brain and also by the environment, and that interventions can hope to affect either, or both, brain and environment, and so affect behaviour. The framework also sets out the processes that practitioners can follow to design and evaluate behaviour change interventions. We then describe how we searched the literature for behaviour change theories and models, locating over 40 of them. We then assigned each theory to a class depending on the parts of the framework they set out to explain. Six such classes were identified:

1/ Single Construct Approaches: e.g., 'Locus of Control'
2/ Multi-Construct Approaches: e.g., the Elaboration Likelihood model
3/ Segmentation Approaches: e.g., 'Stages of Change'
4/ Multi-Level Approaches: e.g., the Social Ecology Model
5/ Community-Based Approaches: e.g., Community Building and Organisation
6/ Process Approaches: e.g., PRECEED-PROCEDE

We set aside a number of approaches that did not seem appropriate to large scale behaviour change. Finally, we show that different approaches in the literature highlight different parts of the framework, and critically evaluate the different classes of approach to behaviour change.

This exercise provides a number of lessons:

- Though there have been attempts to review models and to reach professional consensus, such attempts have been more democratic than critical, and the solutions they offered have generally not been taken up by practitioners.
- A large number of theories are concerned with the determinants of behaviour, not with the determinants of behaviour change. Understanding what causes people to behave as they currently do will not necessarily provide a good foundation for pinpointing how best

- to get them to do something else. This is a very important distinction which seems to be widely ignored.
- Though much evidence has been published for the effectiveness of interventions based on a given model, this still does not allow us to determine which model is the best overall approach. This is because health researchers have usually been advocates for one or another model and have not set out to make comparisons between models.
- Some theories appear to have had notable successes in changing behaviour (such as the Social Norms Approach and Implementation Intentions). We suspect that this is because they have been more successful in identifying real mechanisms in brains that correspond to some natural function that produces behaviour, coupled with the fact that these mechanisms can easily be manipulated by means available to behaviour change interventions.
- We argue that improving future behaviour change programmes will involve a more sophisticated application of current knowledge about how brains work and use of the best practices for intervention planning, design, testing, monitoring and evaluation.
- **We make two recommendations concerning behaviour change**.
  - For current programme developers: **Use a 'Complete Process' Model (similar to a commercial marketing approach) to guide intervention design and evaluation together with a relevant, authentic behaviour change approach to make it effective**.
  - For the future development of behaviour change: **Develop a more general model of behaviour change for inclusion in the Complete Process Model**.

- To promote future work on the development of this more general approach to behaviour change, we also advise the following:
  - Many behaviours of importance to public health and marketing are habitual, but habit has been almost completely ignored by behaviour change theorists and practitioners. It should be tackled more seriously and scientifically.
  - Any approach to behaviour change, whether in public health or in marketing, should make explicit how all of the elements of the framework will be tackled.
  - In a large scale intervention there is rarely the opportunity to use many different approaches to behaviour change together at the same time. Thus the only realistic way to decide which is most effective is to run behaviour change experiments. Though there are methodological challenges to doing so, this is likely to be the most scientific way in which to proceed.
  - Much more work is needed before psychologists will come to any agreement about the nature of the real constructs that exist in human brains. Only with these defined and described will it be possible for health psychologists to interact around an agreed set of terms for the determinants of behaviour.

An accompanying Powerpoint presentation showing details of the models discussed here can be found on the Hygiene Centre website ([www.hygienecentral.org.uk)](www.hygienecentral.org.uk).

5 'take home' points

1. Behaviour change remains poorly understood
2. Most contemporary approaches to behaviour change actually model what determines current behaviour; they are not explicitly concerned with *changing* behaviour, which is a different problem
3. Process approaches such as commercial or social marketing are the most complete approaches to behaviour change available, especially if founded on an appropriate psychological theory of behaviour change
4. Psychological models are more likely to be effective if the constructs they measure closely overlap with mechanisms actually used by brains to produce behaviour
5. Habit and motivation are not well-addressed by current models of behaviour change even though they are probably the two most important targets; models tend to rely too heavily on high-level cognition (volition) to change behaviour

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Introduction

To be able to change people's behaviour at a large scale is the holy grail of health promoters, marketers and policy makers. It is generally recommended that behaviour change programmes should be designed using theory, because basing interventions on theory seems to make them more effective. (Michie & Abraham, 2004) For example, a systematic review of the recent HIV literature (Lyles et al., 2007) notes that all of the studies with good evidence of achieving behaviour change relied on at least one theory. Using theory is certainly popular: a review of health promotion articles published between 1992 and 1994 found that 45% used a model or theory. (Glanz, Rimer, & Lewis, 2002)

Perhaps as a result of these factors, a plethora of theoretical approaches is currently available in the health promotion and related literatures.[1] However, there is as yet no consensus as to which approach provides the best guidance for programme development and implementation, nor which has the greatest impact on behaviour, nor which approach should be applied to which kinds of behaviour. Because theories have generally been used in isolation and have not been tested against each other, we do not know which are the most predictive or practically useful. Complaints about this condition have been made for some time (Nigg, Allegrante, & Ory, 2002; Weinstein, 1993; Zimmerman & Vernberg, 1994). However, it is hard to say that the situation is any better today; in a recent review of the health-related literature, only a few papers (0.4% of 2900 citations in the PsycInfo database) performed empirical tests which compared two or more theories (Noar & Zimmerman, 2005) (see e.g., (Baranowski, Cullen, & Baranowski, 1999; McClenahan, Shevlin, Adamson, Bennett, & O'Neill, 2007; Weinstein, 1993)).

Meta-analyses and systematic reviews can help in one respect: they may provide evidence that particular theories are more or less supported by field tests. Most meta-analyses tend to show some degree of support for the approach under review (e.g., the Health Belief Model (Harrison, Mullen, & Green, 1992; Janz & Becker, 1984); Theory of Reasoned Action and Theory of Planned Behaviour (Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblaus, Carron, & Mack, 1997); Social Cognitive Theory (Bandura, 1998; Graves, 2003; Strecher, DeVellis, Becker, & Rosenstock, 1986); and the Transtheoretical Model (Keller & Velicer, 2004; Prochaska, DiClemente, & Norcross, 1992; Prochaska, Rossi, & Wilcox, 1991; Rosen, 2000; Spencer, Pagell, Hallion, & Adams, 2002)). It may be possible, given this literature, to say that Approach X has an average behaviour change effect of X% while Approach Y has a smaller average effect of Y% in some cases. However, this still does not provide sufficient grounds to declare that Approach X makes a better tool for behaviour change than Approach Y. The two statistical figures will be based on reviews composed of different numbers of studies, which perhaps examine different kinds of behaviour[2], or which have been implemented using different techniques. Meta-analyses and reviews therefore tend to contribute to theory development, but are not a strategy to reduce the current range and diversity of approaches which must be considered by practitioners.

While awaiting comparative studies to be conducted showing that some theories can be excluded from the roster through empirical refutation, a task theorists can perform is some form of theory consolidation. One such approach is *distillation*. Experts can be brought together to produce a single theory of behaviour change which they advocate for general use. (Fishbein, Triandis, & Kanfer, 2001) For example, a 1991 NIMH workshop on HIV produced a distinct model of behaviour change which distilled the insights of the participants through an undisclosed process.

The model that emerged suggested that three conditions are necessary and sufficient to determine behaviour: a strong intention, a lack of environmental constraints, and having the necessary skills. (Fishbein, Bandura, Triandis, & al., 1992) [3] The resulting model looked similar to the well-known Theory of Planned Behaviour (Ajzen, 1991; Fishbein & Ajzen, 1975), and perhaps for this reason, has not been seen as a major advance.

A second approach to theory consolidation is *consensus-building*. For example, a group of health psychologists and health service practitioners recently assembled to find an agreed set of key theoretical constructs (or hypothetical mental entities in brains) for use in evidence based practice of behaviour change (Michie et al., 2005). This workshop reduced 20 types of theory to 12 domains with 101 component constructs relying on a consensus-building process. This was not considered to be a single theoretical approach, but rather a tool-kit from which practitioners could choose.

A number of problems can be identified with respect to the consensus approach. First, combining bits of partial and often competing theories can only add to the complexity of the resulting model, making it harder, not easier for a practitioner to select an appropriate strategy. Second, a shopping list of every possible behavioural determinant still remains atheoretical overall and hence does not provide heuristic means of using the approach. Third, combining hypothesised behavioural determinants in this way does not allow for components of theories to be tested against behavioural outcomes. If, for example, a failure to change behaviour occurs, no one component of the model can be incriminated and removed or modified. Hence such an approach cannot be improved through the iterative process of learning from practice.

A third approach is *amalgamation*. This strategy combines the contents of several kinds of theory into one with the hope of 'covering all the bases'. For example, factors such as psychological determinants, community action and environmental influences might be put together such that they exist in specific relationships to one another (e.g., (Figueroa, Kincaid, Rani, & Lewis, 2002; Thompson & Kinne, 1999); see Figure 1). This strategy therefore has the virtue of being relatively complete, by combining elements from more focused approaches. On the other hand, this strategy does not reduce, but actually increases, the number of factors that practitioners must consider. Further, placing different approaches into a single framework may be empirically justified, but it also forces new, untested relationships on factors from otherwise independent models. For example, what one model leaves as a single factor (such as the environmental context of behaviour) may be exploded into a complete model in itself. But uncritically sliding one model inside another (e.g., a psychological model within a model of the environment) will create specific relationships between psychological factors and environmental ones; the relationships postulated within each model, when considered independently, may not hold within the new context of the larger framework. Such a move also does not consider the possibility that redundancy is thereby introduced into the framework.

Figure 1:
Amalgamation: The Rockefeller Integrated Model
## of Communication for Social Change
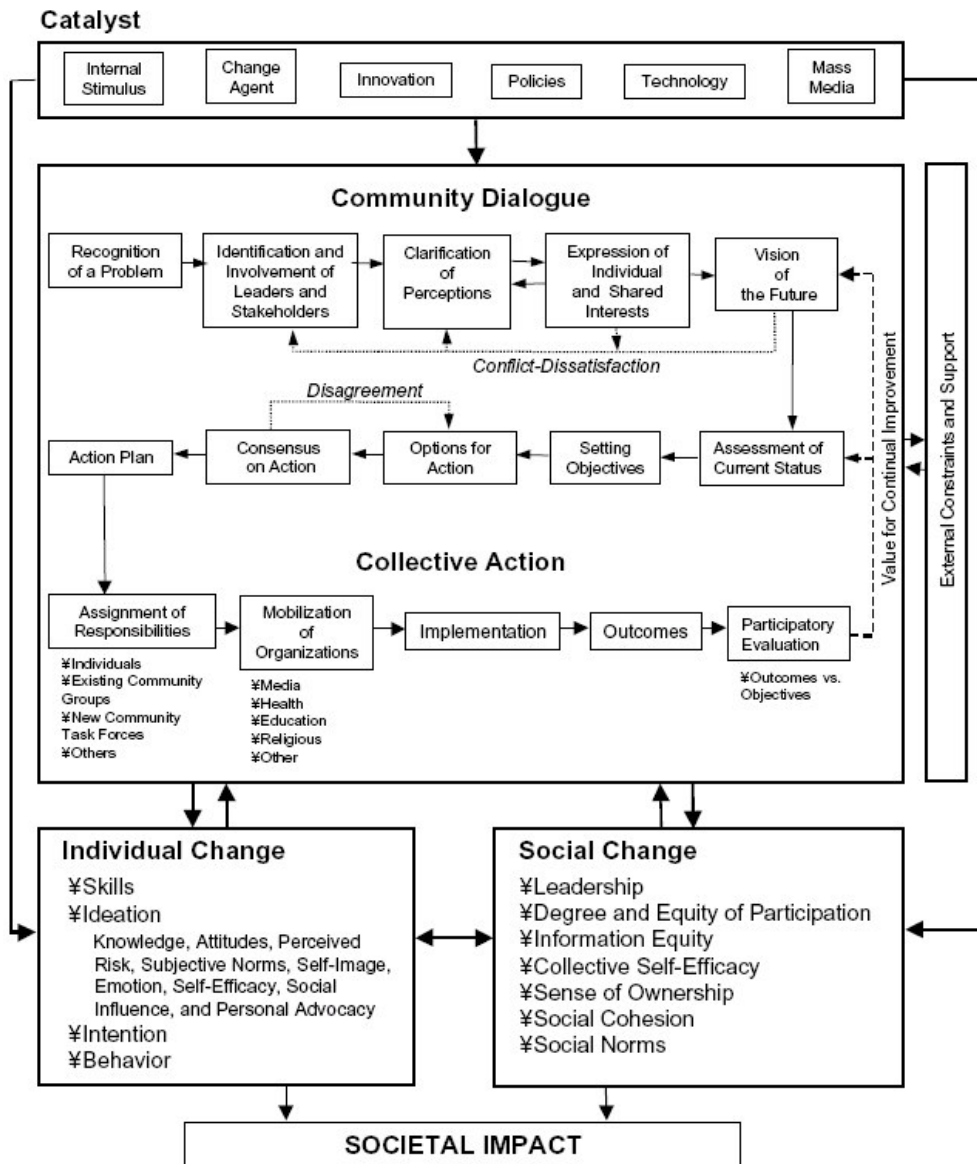
Figueroa and Kincaid, 6/2001

A fourth approach to managing theoretical diversity is *typologization* – the creation of categories of theory. This strategy has been widely used. The most common typology is a unidimensional categorization based on the level of social organisation which is the primary target of intervention: individuals, organisations, communities, or populations. (McLeroy, Bibeau, Steckler, & Glanz, 1988; Stokols, 1992) While most behaviour change approaches are based in psychological constructs, and so work at the individual level, other approaches are directed at the development of groups of people at these different levels of organisation.

A two-dimensional typologization has been provided by Beattie. The first dimension of Beattie's map (Beattie, 1991) is the level of social organisation -- ranging from individual to collective -- which is targeted, as in the uni-dimensional typologizations. His second dimension is the 'mode of intervention' -- which ranges from 'authoritative' to 'negotiated' -- measuring the power relationship between programme implementers and the population (see Figure 2). This dimension is similar to the categorization provided by Rothman (Rothman, 2001) for community-based approaches to behaviour change. He argues that the degree of involvement of community members lies along a continuum:

- *Social planning* involves a group of experts from outside the community solving local problems with the help of community members
- *Locality development* involves experts and community members working together as equals
- *Social action* is controlled by community members, who try to increase their power to deal with issues that are important to them.

Figure 2:
Beattie's Typology of Behaviour Change Approaches
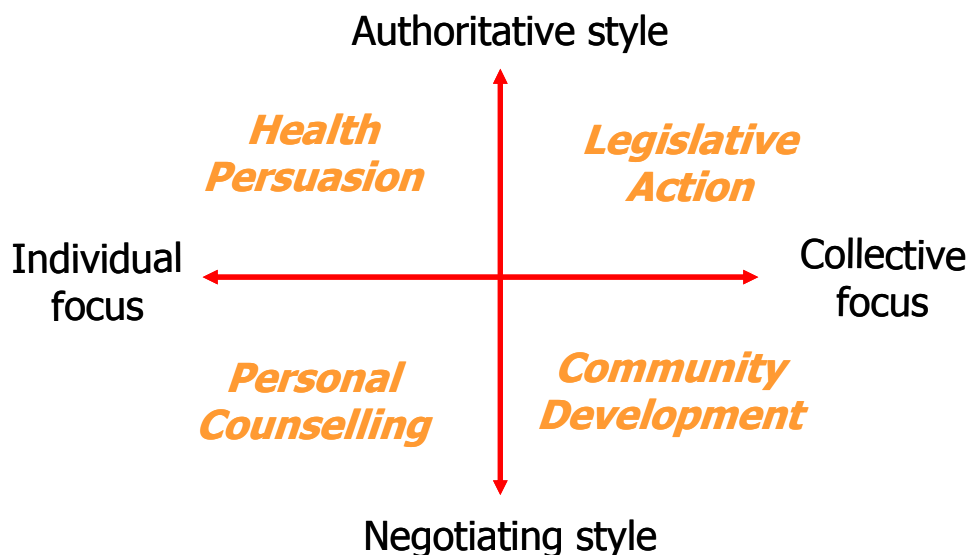
The goal of such typologizations is not to reduce the number of approaches available; it does not throw approaches into a single framework, like *amalgamation*, but instead provides criteria for comparing theories on theoretical grounds. In this way, it may direct a practitioner's attention toward a particular category of approach, given their problem at hand, and thus reduce their options in a given instance.

There are further problems with all of the theory building approaches set out above. None discussed thus far draw on the advances that have been made in recent decades in the understanding of brain and behaviour. For example, few current models use well-established neuroscientific constructs such as attention, habit, memory and reward. Further, even armed with

comprehensive lists of mental constructs that are thought to determine behaviour, neither specialist psychologists nor lay practitioners have precise and agreed definitions of the terms in the approaches they use, making it hard to apply them comparatively, or with any rigour. Finally, none of the attempts outlined above have provided models simple or comprehensive enough to find common usage amongst practitioners. [4] In effect, efforts at *distillation*, *consensus* or *amalgamation* just add to the confusion by creating additional, derivative approaches. Though *typologization* does not add to the total number of approaches available, it does not reduce them either.

The approach we use in this paper is to consolidate theory through *synthesis*, or the combining of components from different approaches to form a new, coherent whole. The synthesis we provide here results in a generic framework for representing behaviour change approaches. S*ynthesis* is more likely than *distillation, consensus, typologization* or *amalgamation* to aid both in theory consolidation, and in the development of effective behaviour change programmes. This is because it provides a parsimonious but general approach to behaviour change. It is parsimonious because it eliminates redundancies in the number and types of factors that need be considered. But it is also powerful because it is able to represent any behaviour change approach using a minimal set of components, thus facilitating the critical comparison of approaches. It can also serve as the single approach that need be considered by any practitioner, since it can be adapted to any situation. *Synthesis* also provides for a multi-dimensional typologization of other approaches, based on the kinds of components included in those approaches. This serves as a more powerful means of typologizing than the two-dimensional models available thus far.

We provide here a systematic review of the primary literatures concerned with behaviour change, classing the various approaches according to the synthetic conceptual framework we have developed by consolidating other models. [5] This comparison provides the basis for an examination of the strengths and weaknesses of each category of approach, and allows us to draw conclusions about current lacunae in knowledge, important future directions for research, and pending the result of such research, how to make best use of the theories that are available. First, however, we describe our framework in greater detail.

A Synthetic Conceptual Framework for Behaviour Change

Health-related behaviour can be influenced in many ways. For example, people can be provided with reminders, with convincing arguments, with role models, with products and services, with the skills and the confidence to use them, with opportunities to work together to change the environment, or they can be coerced to change through the threat of punishment and the power of social institutions. Health promoters design interventions that can affect one or more of such factors and they do this through processes which are either set out explicitly, or that are implicit in their approach. Processes in programme design include formative research to understand the determinants of behaviour, creative development of strategies and approaches, quantitative and qualitative testing, and the monitoring and evaluation of programmes so as to improve them and provide lessons for future programmes. Is it possible to combine all of these aspects of behaviour change theory and process into one overarching and generic framework?

We believe it is. Our framework has seven kinds of components:

- outcomes
- behaviour
- psychological constructs
- environment
- interventions
- causal links
- processes for designing/evaluating interventions

Figure 3 shows how these components relate one to another. At the core of the model is the brain-behaviour relationship. For an existing behaviour to change to a new one, something has to change within the brain of the actor. Psychologists assume that there are discrete entities or processes within brains which influence behaviour. How they work is largely hypothetical; for this reason, they are called psychological 'constructs'. Psychologists disagree about what these constructs are, how many there are, or how to define them. For a construct to change in a brain it is necessary to modify the environment which the brain inhabits. This might be a change in the physical environment (for example, products, facilities, or messages on a TV screen); the social environment (for example, the way in which others behave, or the support services on offer); or the biological environment (for example foodstuffs or addictive chemicals ingested by the body). The brain perceives and interprets such stimuli and this may, or may not, lead to the performance of a behaviour or a change in an existing pattern of behaviour.

Further upstream in the model we place interventions. These are designed to alter specific aspects of the environment, and hence to affect constructs in brains and hence behaviour. Interventions might include developing, manufacturing and distributing a new product that replaces nicotine in the body (affecting the physical environment), or advocating for a change in the law regarding tobacco (affecting the social environment).

Surrounding the brain-behaviour model as the 'frame' of the framework are representations of the processes that assist in the design, delivery and evaluation of interventions. First, formative research attempts to systematically document behaviour, psychological constructs, environmental variables, and sometimes the state of current interventions, so as to inform the design of programme interventions. In the commercial world this is similar to consumer research. Findings from formative research are then fed into a process of design and testing of potential programme interventions. Once the intervention is in place monitoring and evaluation begin (represented at the lower edge of the framework). Monitoring and evaluation processes reverse formative research in that they seek to document what has changed in the environment, in brains, in behaviour, and sometimes in health outcomes too. The results of monitoring assist with programme adjustment, and outcome evaluations are expected to provide information that is useful for the next generation of interventions.

This framework can be used to show how different categories of approach relate to one another. It allows us to critically *compare* approaches, rather than simply combining them, as in the consensus or amalgamation approaches, or reducing them to a single model, as in the distillation approach. It thus provides a powerful means of assessing the entire range of available approaches to behaviour change in the literature. After discussing the methods we used to systematically locate these approaches, we show that any approach can be categorised according to which parts of this framework it addresses.

Figure 3:
The Behaviour Change Framework
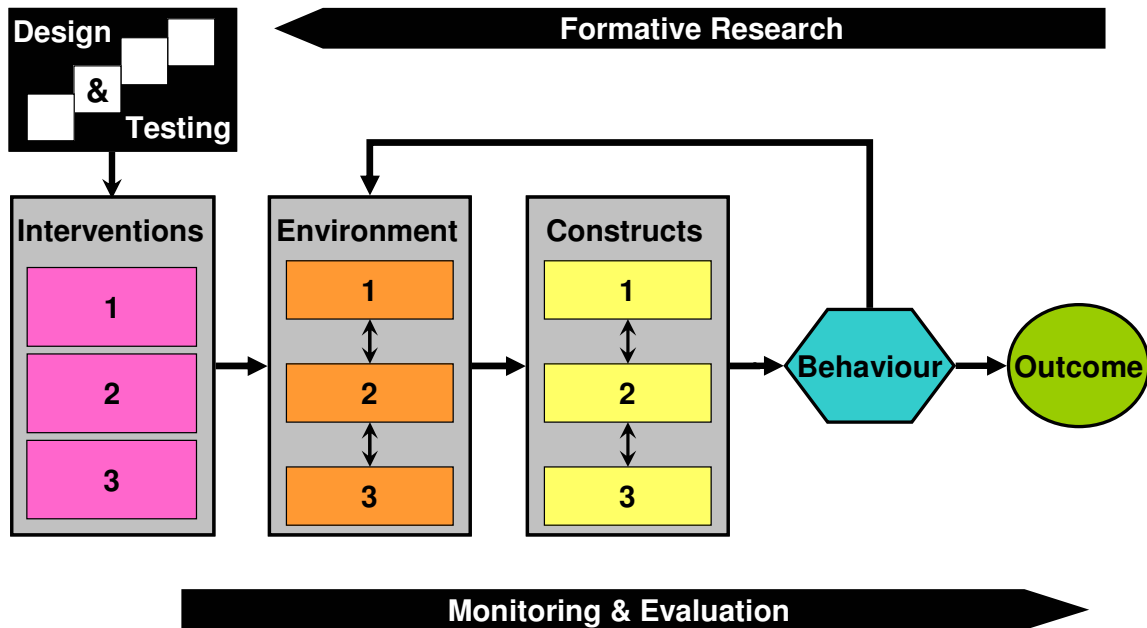
Methods

The literature review is based on a systematic search of the academic literature for behaviour change approaches. Our procedure included the following searches:

- Amazon.com for recently published books using the search terms 'behaviour change theory', 'health promotion' and 'social marketing' (Andreasen, 1995; Breinbauer & Maddaleno, 2005; Curtis, 2000; DiClemente, Crosby, & Kegler, 2002; Donovan & Henley, 2003; Glanz et al., 2002; Kotler, Roberto, & Lee, 2002; Nutbeam & Harris, 2004)
- PubMed and ScienceDirect databases for scientific articles which reviewed behaviour change theories using the search terms 'behaviour change theory', 'health promotion theory' and 'social marketing theory' (Fishbein et al., 2001; Glasgow, Klesges, Dzewaltowski, Bull, & Estabrooks, 2004; Grier & Bryant, 2005; Hardeman, Griffin, Johnson, Kinmonth, & Warehman, 2000; King, Stokols, Talen, Brassington, & R., 2002; Michie et al., 2005; Nigg et al., 2002)
- A Google-based internet search using the search terms 'behaviour change theory', 'health promotion theory', and 'social marketing theory'. (The areas of organisational psychology, communication theory and decision-making were not reviewed, due to limitations of space.)

- Reports of meetings on behaviour change (Figueroa et al., 2002) (Aunger, SPARK report)
- Personal acquaintance with approaches developed by a variety of organisations working on behaviour change (Chapman & Patel, 2004; Kincaid, 2000)

Forty-six different approaches to behaviour change were uncovered through this process. However, a number of approaches were eliminated from the review for a variety of reasons, leaving 35 approaches to be discussed. [6]

Categories of Behaviour Change Approaches

We next categorise the approaches according to where they fit in the generic framework. All 35 approaches can be grouped into six categories: Single Construct, Multi-Construct, Segmentation, Multi-Level, Community-Based and Process approaches. For each category, we list, describe and compare the approaches, show how they fit our framework, and provide a critical analysis of the strengths and weaknesses of that category.

1/ Single Construct Approaches

The simplest type of approach to changing behaviour assumes that changing a single aspect of people's psychology can have the desired effect on the target behaviour. Figure 4 below shows how Single Construct approaches map onto our generic framework. In effect, these models consider only a single construct and its influence on behaviour; the rest of the factors in the framework are ignored (and hence are shown in grey). Table 1 lists 12 approaches of this type, with a brief description of each approach in this category, accompanied by its key assumptions, the primary academic source of the approach and the kinds of behaviour which have been addressed using it.

An approach in this category is typically limited to one basic 'trick'. For example, the Intrinsic Motivation Approach (Deci, 1976) makes the counter-intuitive argument that providing people with tangible rewards (such as money or praise) will, in most circumstances, undermine intrinsic motivation. Thus, for a variety of behaviours, providing incentives will result in decreased, rather than enhanced, performance, because the natural 'joy' of carrying out the behaviour has been diminished by the offer of compensation. The 'trick' in this case, then, is to find a way to increase people's natural enjoyment of engaging in the target behaviour, rather than providing inducements for doing it.

TABLE 1: Single Construct Approaches

APPROACH	BEHAVIOUR CHANGE OBJECTIVE	KEY ASSUMPTIONS	PRIMARY SOURCE	DOMAINS OF USE
Single Construct	*To effect behaviour change by modifying a single factor*	*Changing a single variable can change behaviour*		
Operant Conditioning	To create reinforcement contingency schedules that induce desirable	Behavioural choice is the result of previous reinforcement and/or	Skinner, 1938	general

		habits/behaviours	punishment		
Social Comparison Theory	To get people to compare themselves to healthy models	People tend to form opinions of themselves based on reference to the traits of others in their reference group, especially when information is vague	Festinger, 1954	general
Cognitive Dissonance	To get individuals to experience greater dissonance and hence make them more likely to attempt to reduce it by changing their behaviour	Individuals who hold beliefs contrary to their own behaviour (cognitive dissonance) experience discomfort and anxiety	Festinger, 1957	smoking cessation
Locus of control	To increase an individual's perceived degree of internal control	Believing that control is in one's own hands can facilitate behaviour change	Rotter, 1966	general
Goal-setting Theory	To get people to set themselves precise, difficult, health-enhancing goals	Setting specific, difficult goals leads to higher performance than vague, non-quantitative goals	Locke, 1968	general
Intrinsic Motivation Theory	To find means of increasing people's natural enjoyment of the desired behaviour	People engage in some activities for their own sake; external incentives reduce this motivation	Deci, 1975	education
Cognitive Adaptation Theory	To increase cognitive adaptation (i.e., optimism, self-esteem and self-control)	People possess unrealistically positive views of themselves that enhance their well-being, manifest as optimism, a sense of control, and self-esteem	Taylor, 1983	general
Social Norms	To use messages to correct misperceptions concerning the behaviour of others in the social group	People seek to conform to the example of peers when deciding how to behave; people attribute memorable bad behaviour to entire peer-group	Perkins and Berkowitz, 1986	substance abuse, safe driving
Conservation of Resources Theory	To decrease an individual's sense of threat against resources held	Stress is a an individual's reaction to the threat of resource loss (where resources can be objects, personal characteristics, conditions or energies)	Hobfoll, 1989	work vs. family relation-ships
Fear Appeal Theory	To scare people with threats to their health and well-being	Fear motivates individuals to take action to reduce their apprehension about health issues	Witte, 1992	civil obedience
Effort-Reward Imbalance	To increase an individual's sense of effort-reward imbalance and hence cease	An imbalance between the efforts put into work and the psychological rewards received induce stress	Siegrist, 1996	work

	practicing an undesirable behaviour			
Implementation Intentions	To induce people to form intentions that promote a desired behaviour	Forming intentions to respond to future cues can facilitate habit formation	Gollwitzer, 1999	general

Other Single Construct Approaches suggest similar 'tricks'. The Social Comparison Approach has a strong and important lesson to teach: people care about what others in their social group do, and will likely model their own behaviour on the example of others because people are intrinsically social and care about fitting in. The problem is that this 'trick' does not provide a clear means of deciding upon an intervention strategy because its message is so broad. Who should be targeted for intervention? What should they be invited to do so that others will copy them? Although this approach has a powerful message, it isn't one that can actually be used easily for behaviour change.

Figure 4: Single Construct Model
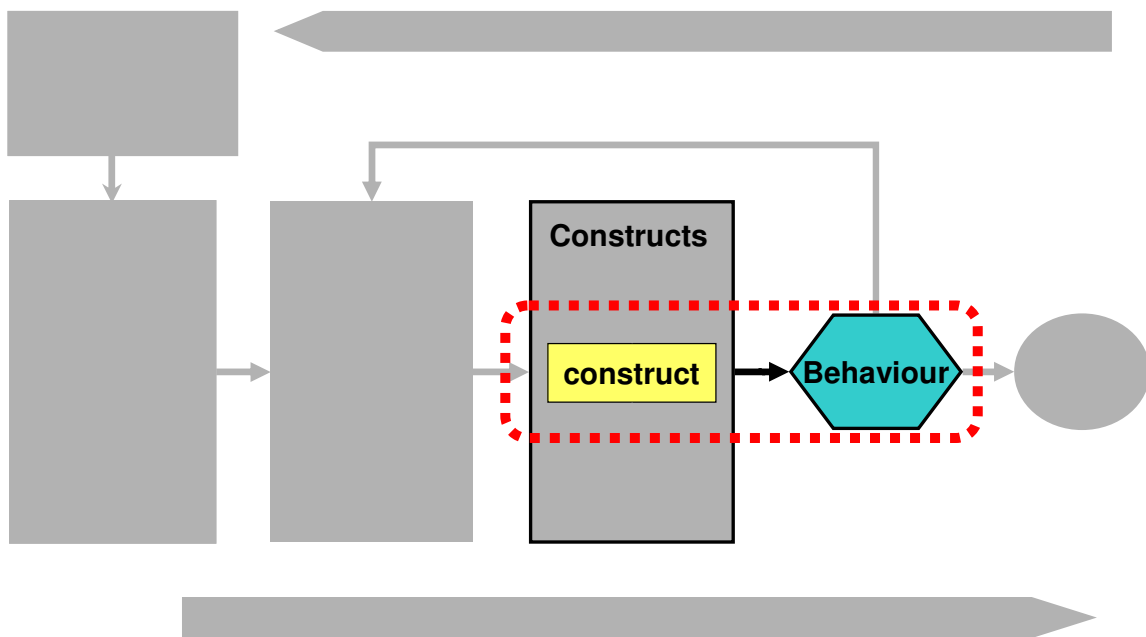
The Social Norms Approach (Perkins, 2003) builds on the Social Comparison Approach by making a more specific claim. It too argues that people model their own behaviour on that of others. However, it is based on a specific mechanism: people tend to form ideas about what others in their social group do based on extreme examples of behaviour. This is because we all have a mental bias that favours the formation of memories of unusual events. Hence, we remember when some acquaintances got searingly drunk and made fools of themselves, but not when we went to the pub with some friends, had a pint and went home peacably. As a result, we tend to overestimate the amount of alcohol that members of our social group consume, and particularly the proportion of our group who have a 'problem' drinking. As a result, we tend to think we have to drink more than we really need or want to in order to be fit in. However, if we are told what that actual behaviour is, we are likely to reduce our own drinking as a result because we wish to conform to the average behaviour of our group. This has, in fact, been found to occur.

Simply by collecting data on average drinking behaviour and educating the target population about what their peers are actually doing has proven highly effective in reducing problem drinking on many American college campuses. (Perkins, Haines, & Rice, 2005) The approach may also be of much more general use, since there is reason to believe that misperceptions about normative behaviours are widespread.

Assessment

The strengths of these 'single trick' approaches include:

- simplicity
- some have strong empirical support (such as the Social Norms Approach)
- inclusion of specific mechanisms for changing behaviour

They also have a number of weaknesses:

- can be restricted in application
- constructs can be abstract or complex
- too many kinds of approach to choose from

In sum, Single Construct approaches offer us little guidance about which 'trick' to pick faced with problem behaviours that may have multiple causes. Models in the second category begin to address this issue.

2/ Multi-Construct Approaches

A wide variety of approaches have been proposed which predict behaviour by postulating relationships among various psychological constructs and behaviour. Figure 5 shows how Multi-Construct approaches sit within our framework – recognizing the roles of a number of constructs and their impact on behaviour, together in some cases with a single factor that represents environmental constraints. Table 2 lists 10 such approaches divided into those originating in health psychology and another set of diverse origin.

TABLE 2: Multi-Construct Approaches

APPROACH	BEHAVIOUR CHANGE OBJECTIVE	KEY ASSUMPTIONS	PRIMARY SOURCE	DOMAINS OF USE
Multi-Construct	*To determine which psychological constructs are significantly correlated with the target behaviour*	*Behaviour can be predicted from its causes*		
Health Psychology Group				
Health Belief Model	To increase perceived susceptibility to a threat or its perceived severity and hence motivate actions to reduce such threats;	People weigh expected benefits against costs in deciding what to do	Hochbaum, 1956	general

	alternatively, to increase perceived benefits or reduce barriers to benefits and so increase likelihood of desirable behaviour			
Theory of Reasoned Action/ Planned Behaviour	To influence attitudes about the likelihood that the behaviour will have the expected outcome	The subjective evaluation of the risks and benefits of an outcome form an intention, which proximally determines behaviour	Ajzen and Fishbein, 1973	general
Social Cognitive Theory	To increase a person's sense of self-efficacy or to reduce barriers to the desired behaviour	A person's sense of self-efficacy is the fundamental prerequisite for engaging in behaviour	Bandura, 1977	general
Theory of Interpersonal Behaviour	To change habits, facilitating conditions or attitudinal beliefs that support desirable behaviour	Behaviour is shaped by habits and personal beliefs as well as norms and attitudes	Triandis, 1977	general
Information-Motivation-Behavioural Skills Model	To increase people's perception of risk of non-compliance, degree of education, attitudes or perception of norms that might promote the desired behaviour	Behavioural skills and knowledge, not self-efficacy, are important proximate determinants of behaviour	Fisher and Fisher, 1993	HIV/AIDS
Diverse Group				
Transactional Theory of Stress and Coping	To increase people's tendency to seek relevant information, their degree of optimism, perceived coping resources, or evaluation of the controllability of threats	People's response to stress is mediated by their coping ability and psychological resources associated with the stress response	Lazarus, 1966	work
Social Regulation Theory	To induce a new health goal or increase the perceived discrepancy between current conditions and an existing health goal	Goal-seeking behaviour is determined by cognitive and behavioural processes that involve the initiation, termination, modulation, modification, or redirection of a person's emotions, thoughts, behaviours, physiological responses, or environment	Carver and Scheier, 1981	general
Social Networks and Social Support	To increase the size, density and supportiveness of personal networks	Health status is related to the strength of social networks	Heaney and Israel, 2002	general
Elaboration	To produce persuasive	People can persuade others	Petty and	outside

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Likelihood Model	messages that cause enduring, desirable attitude changes	to change their attitudes by communicating to them using material presented in a form that encourages creative interaction	Cacioppo, 1986	health
Social Influence Approach	To find ways to increase the tendency of people to find rewards in their relationships with those who represent healthy influences on them	What people do is dependent on the influence of others (not just socially learned information); people are interdependent	Lewis, 2002	general

Within this category, comparison with our framework suggests there are two sub-categories. The first sub-category emphasises the association between psychological constructs and behaviour, while the second sub-category does not explicitly address behavioural outcomes, rather tending to be concerned about the management of internal variables such as stress or attitudes. As the first sub-category shares an origin in health or cognitive psychology more generally, we will call it the 'Health Psychology' Group. Some of the approaches in this sub-category derive from mainstream psychology and are intended as general explanations for behaviour (e.g., Theory of Planned Behaviour or Social Cognitive Theory); others have been developed specifically in health psychology to deal with health-related decisions (e.g., Health Belief Model). Yet others are derived from these primary theories (e.g., the Information-Motivation-Behavioural Skills (IMB) model (Fisher & Fisher, 1993) in the HIV/AIDS literature).

The second subgroup is an odd mix, probably because most of them have independent origins outside of cognitive psychology, and so will be called the 'Diverse' Group. The one approach which does have a traditional origin in this group is the Transactional Theory of Stress and Coping, (Lazarus, 1966; Lazarus & Cohen, 1977) which argues that stress results from an 'imbalance between demands and resources' or occurs when 'pressure exceeds one's perceived ability to cope'. It has no behavioural outcome, but does include changing the environment (i.e., the stressor) which causes a psychological problem which must be addressed. Trying to increase stress could be a way of addressing some public health problems (e.g., as a means to get people to stop smoking), and trying to increase perceived coping ability or psychological resources can reduce the health problems associated with stress. But stress is not an aspect of every public health problem, so the Transactional Theory is unlikely to be a general approach.

Each of these approaches has its own idiosyncracies which restrict their general use. For example, Social Regulation Theory, (Carver & Scheier, 1981) being based on a cybernetic theory of behaviour (Miller, Galanter, & Pribram, 1960), has very abstract constructs (e.g., 'comparator', 'throughput function', 'disengage') which seem to bear little relationship to recognised functions of the brain, such as memory, emotion or planning. While it is theoretically a very general approach, it is also so abstract that it is difficult to use in developing specific hypotheses about behaviour change, or to test the validity of its constructs.

There is considerable variation between the theories with respect to what they consider to be important determinants of behaviour. In particular, there is little overlap between what the Health Belief Model, Theory of Planned Behaviour, and Social Cognitive Theory, consider to be important – each of these 'Big 3' approaches has tended to specialize in quite different constructs. There is, however, some consensus about the importance of beliefs, attitudes, norms,

intentions and environmental barriers in this class as a whole. In many cases, the relationships suggested between constructs also overlap between approaches. In particular, it is common for environmental variables to be considered as exogenous determinants of beliefs, attitudes and expectations. Beliefs, attitudes and expectations, in turn, often feed into the formulation of an intention, which is considered the proximate determinant of behaviour by many of the approaches in the Health Psychology subgroup (e.g., the Theory of Planned Behaviour, Social Cognitive Theory, and Theory of Interpersonal Behaviour).

Figure 5: Multi-Construct Model
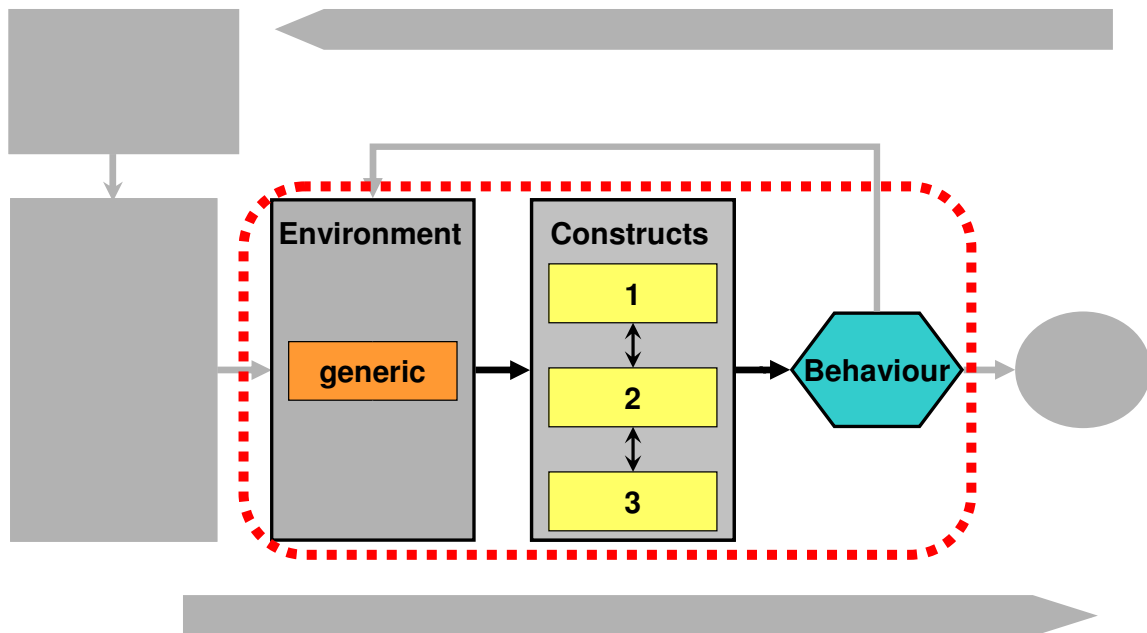
Assessment

Strengths:

- Multi-Construct approaches generally exhibit broader applicability than Single Construct approaches, because they include multiple relationships
- they are very popular, so considerable empirical evidence for the utility of some constructs and approaches (for example, many of the relationships among constructs hypothesized by Social Cognitive Theory are well-supported (Baranowski, Perry, & Parcel, 2002) and implementations based on this approach are commonly viewed as effective (Bandura, 1998))
- they can be used at scale

Weaknesses:

- some approaches rely on heterogeneous theoretical foundations
- the category exhibits an almost exclusive reliance on individual psychology as a determinant of behaviour when other factors – such as a variety of environmental and policy barriers -- also play an important role in determining behaviour

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- A lot of overlap in construct use and structure of relations among constructs between approaches

For many Multi-Construct approaches, it is difficult to assign responsibility for success to particular constructs as the mix of constructs varies from implementation to implementation. Systematic reviews of Social Cognitive Theory are relatively few, probably due to its complexity and heterogeneity, although reviews have shown good associations between various kinds of desirable behaviour and self-efficacy. (Keller, Fleury, Gregor-Holt, & Thompson, 1999; Stajkovic & Luthans, 1998) The similar Theory of Planned Behaviour has a record of generally good performance as a foundation for intervention (Armitage & Conner, 2001), including support for the relationships predicted to hold among constructs (such as intentions being based on attitudes, subjective norms and attitudes being associated with behavioural beliefs, and norms being associated with normative beliefs) (Albarracin et al., 2001). Some reviews are equivocal, however, again partly due to the difficulty of assigning responsibility to particular constructs in some literatures. (Hardeman et al., 2002)

A number of fundamental difficulties are associated with basing a programme of behaviour change on either a Single or Multi-Construct approach:

- people cannot accurately report on, nor predict, their motives and beliefs because they simply aren't aware of them – such factors often exist below consciousness
- the motivation which inspires the continuing practice of a behaviour can be quite different from the motivation which caused an individual to adopt the behaviour in the first place (for example, people often stop smoking 'cold turkey' because they are disgusted by their own behaviour, but stay off smoking because they are convinced of the health risks
- it is difficult to measure psychological constructs which are internal to the mind and thus not directly observable
- many of these approaches rely on relationships among multiple constructs, but it is difficult to test all of the hypothesized relationships between constructs simultaneously, especially in the context of field studies

As a result, when results do not demonstrate support for the hypothesized relationships, it cannot be taken as disconfirmation of a theory as a whole – instead, new relationships between constructs can be hypothesized. (Valdiserri, Ogden, & McCray, 2003). Thus construct-based theories are never falsified by experience, they just get modified. These constitute severe limitations on the use of construct-based approaches when designing behaviour change programmes. For reasons such as these, a number of practitioners have recently rejected continued use of such approaches. (Brug, Oenema, & Ferreira, 2005; Jeffery, 2004; Resnicow & Vaughan, 2006; Valdiserri et al., 2003)

3/ Segmentation Approaches

The approaches covered thus far suggest that behaviour can be predicted by measuring psychological constructs and the external influences on them. (Conner & Norman, 1996; Michie et al., 2005; Weinstein, Rothman, & Sutton, 1998) However not everyone is the same. Suppose an intervention about the disgusting nature of smoker's lungs convinces 10% of the population to give up smoking. Then another series of ads about disgust has much less effect. The reason may be that all of the population suggestive to messages about disgust may be exhausted and another sub-group now needs to be targeted using a different kind of tactic.

A third category of behaviour change approaches is therefore concerned with identifying different portions of target populations which are at different likelihoods of changing their behaviour, segmenting the population into a variety of classes (see Table 3 for a list). The distinctive feature of Segmentation approaches is the idea that the determinants of action vary for different individuals, depending on which segment they are in, suggesting that the most effective intervention can be quite different from one segment to another. (Weinstein, 1988) Hence different personalities and experiences can practice the desired behaviour, but for different reasons. This is the major advantage of a Segmentation approach over those we have considered thus far.

Segmentation approaches can be imagined as adding another dimension to our framework. In effect, each population segment can be represented by a different set of parameter values for the various factors used to segment the target population (see Figure 6).

TABLE 3: Description of Segmentation Approaches

APPROACH	BEHAVIOUR CHANGE OBJECTIVE	KEY ASSUMPTIONS	PRIMARY SOURCE	DOMAINS OF USE
Segmentation	*Divide the target population into groups distinguished by particular features so as to design appropriate interventions*	*People are different and so require different interventions to change their behaviour*		
Stages-of-Change	To design and implement interventions which target specific segments of people and hence move them to the next stage of change	All individuals move through a precise sequence of steps prior to engaging in new behaviours	Prochaska and DiClemente, 1983	smoking cessation
Diffusion of Innovation	To get early adopters to adopt the target behaviour and hence begin the diffusion of the behaviour through the population	People differ with respect to their willingness to adopt unfamiliar behaviours	Rogers, 1995	techno-logical innovations

Marketers have long recognized that populations exist as segments with different profiles, only one of which can be reached by any given effort. (Andreasen, 1995; Kotler et al., 2002; Malbach, Rothchild, & Novelli, 2002) So have a number of approaches in the academic literature -- in particular, the Stages-of-Change Approach (also called the Transtheoretical Approach) (Prochaska & DiClemente, 1983) and the Diffusion of Innovation Approach (Rogers, 1995).

The Stages of Change approach is a particular kind of segmentation model: a stage-based model. It presumes that changes happen in sequential steps, associated with progress through different segments, toward the adoption of a new behaviour. In particular, the Stages-of-Change Model asserts that people always pass through a particular sequence of stages in order (i.e., from

'pre-contemplation' of change, to 'contemplation', 'preparation', 'action' and 'maintenance' of change), without skipping any stage. Stage-based approaches are concerned to identify distinguishable segments of populations which are more or less likely to change their behaviour, based on some characteristic, or set of characteristics. Segmentation approaches also divide populations into distinguishable groups, but not necessarily with respect to their relationship along a single continuum. Segments might be defined simply by what kind of place they live in: urban or rural, or by socioeconomic class.

Figure 6: Segmentation Model
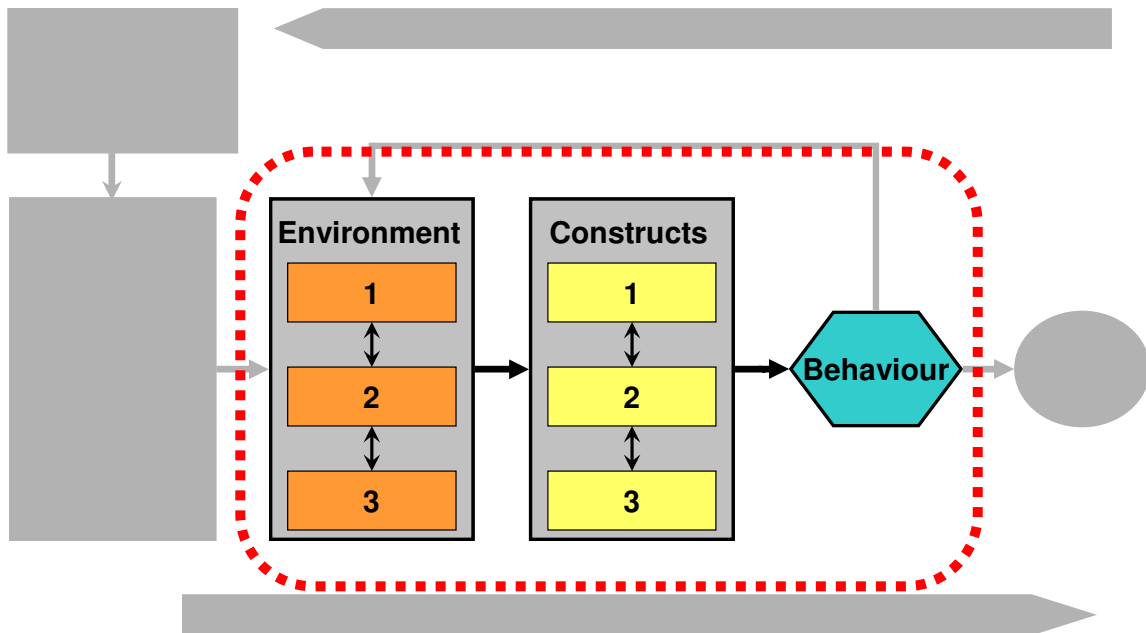
Assessment

Strengths:

- it is the only category to deal with the important problem of population segmentation
- the utility of targeting specific segments for change is clear
- the Diffusion of Innovation approach recognizes the possibility that an intervention can have added value if it causes interpersonal transmission effects (e.g., 'word-of-mouth') which extends programme effects to those who may not have had direct contact with programme activities

Weaknesses:

- linear progress through stages of change is not well-supported
- the Diffusion of Innovation approach requires target behaviours to be perceived as 'new' and remains silent on the likelihood of adoption due to other reasons; it can only model the likelihood of adoption of a behaviour as a function of its degree of perceived novelty (it suggests that the less novel the behaviour, the more likely it is to be adopted by a majority of people)

Conceptually speaking, Stages-of-Change is a general theory of behaviour change; unfortunately, its central claim seems to be weakly supported empirically. A major problem with stage-based approaches is that not everyone necessarily proceeds in proper sequence through each of the defined stages (Sutton, 2000a; Sutton, 1996). For example, in one study, only 16% of participants progressed from one stage to the next without reversals over a two year period and 12% moved backwards during the same period. (Prochaska et al., 1991) As this is the central claim of the Stages-of-Change approach, this debilitates its theoretical value considerably. Further, there is little evidence that targeting interventions at people in specific stages makes programmes more effective. (Bandura, 1998; Sutton, 2000b; Weinstein et al., 1998)

The Diffusion of Innovation approach only secondarily hypothesizes about the psychological process of behaviour change; it is primarily intent on dividing populations into segments by their attitude toward novelty-adoption. It doesn't assume that people change their attitudes, and hence move from one segment to another; instead, the Diffusion of Innovation Approach describes how innovations are taken up over time even by those most reluctant to accept new ideas or products. Thus, one Segmentation theory describes the movement of individuals through different psychological stages, while the other describes the movement of an innovation through a heterogeneous population.

4/ Multi-Level Approaches

Nearly all of the factors appearing in the approaches considered so far are measures of individual psychological functioning. An important category of causes of behaviour is left unspecified – that of the physical and social context in which behaviour is performed. [7] At best, this is recognized by construct-based approaches in the form of a single factor: 'environmental constraints' (e.g., Fishbein, 1992}). However, this covers a broad range of variable constraints to and facilitators of behaviour. By not addressing crucial variables such as the availability of, or access to, physical or social resources, behaviour change programmes targeted at an individual's psychology are not prompted to deal directly with the environmental and institutional factors that may inhibit or encourage behaviour change. Some therefore advocate turning to more environmentally-oriented theory (Brug et al., 2005; Jeffery, 2004). By targeting interventions at a higher-level (e.g., institutions, communities and environments), barriers to behavioural change can be removed at scale. For example, making sidewalks and playgrounds easier to access can increase people's willingness to exercise. (Owen, Humpel, Leslie, Bauman, & Sallis, 2004)

Table 4 summarizes features of these approaches; Figure 7 demonstrates that they emphasize the role of a number of aspects of the environment, working through a variety of psychological constructs, to determine some kind of outcome (primarily a measure of population health).

TABLE 4: Multi-Level Approaches

APPROACH	BEHAVIOUR CHANGE OBJECTIVE	KEY ASSUMPTIONS	PRIMARY SOURCE	DOMAINS OF USE
Multi-level	*Behaviour change requires simultaneous attention to psychological, physical, and socio-political environmental*	*Behaviour is highly constrained by environmental and other circumstances*		

		determinants			
Ecological Models	To change the physical, built or socio-political environment in a way that promotes desirable behaviour	Behaviour is determined by environments as well as individual psychology	McLeroy, Bibeau, Steckler, and Glanz, 1988; Stokols, 1992; Hovell, Wahlgren and Gehrman, 2002	obesity, physical activity
Risk and Protective Factor Model	To reduce the influence of risky conditions and increase the influence of protective factors on individuals	Conditions or situations in home, school, among peers, and in the community can increase (risk) or decrease (protective) the likelihood that a person will develop health and/or behaviour problems	Catalano and Hawkins, 1996	adolescent drug abuse, violence and delinquency
Resilience	To increase the capacity all individuals have for healthy development; to promote the characteristics of families, schools, and communities which foster this resilience	People have an innate ability to develop normally, even in high-risk environments	Werner and Smith, 1982; Bernard, 2004	adolescent drug abuse, violence and delinquency

Figure 7: The Multi-Level Model
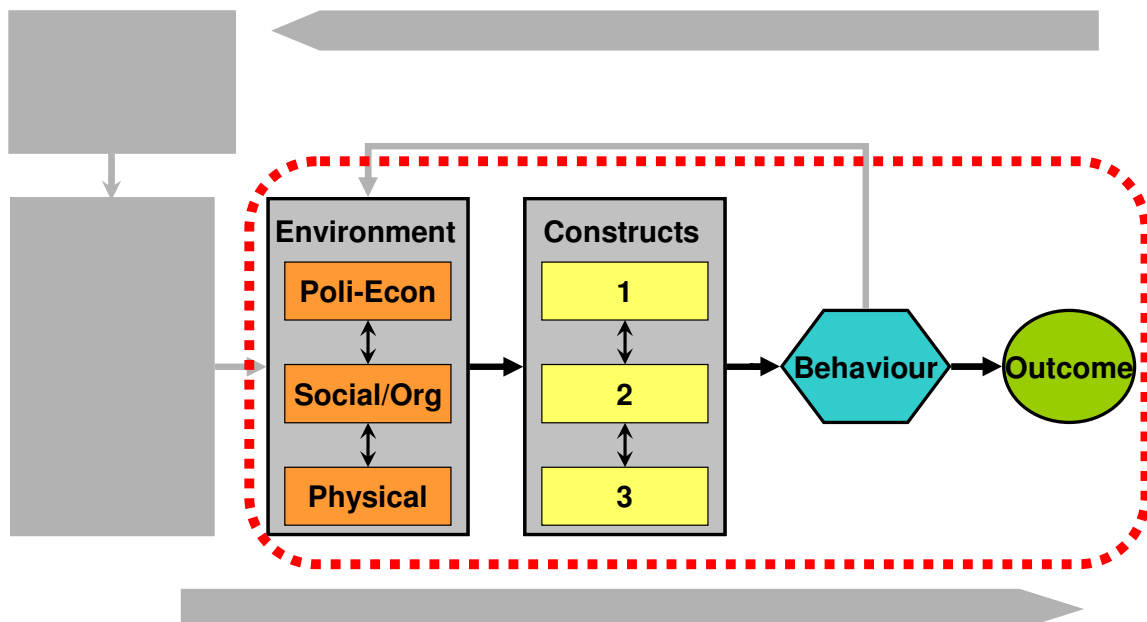
Several of these approaches have been called 'ecological' because of their focus on the environment. [8] Ecological models recognize that people are embedded in social and physical environments which impact on their health. The defining feature of an ecological model is that it

takes into account the physical environment and its relationship to people at individual, interpersonal, organizational and community levels. It thus recognizes that interventions might need to address hierarchical and multiply interdependent levels of causation to be effective. (Stokols, 1992) In a sense, this is advocating psychologically-based behaviour change at one remove: the gatekeepers at various levels of social organisation must be convinced to change the environment within which the targeted people make their decisions. This requires the development of intervention strategies aimed at changing the minds of policy-makers. (Brug et al., 2005)

The other models in this category (the Risk and Protective Factor Model (Catalano & Hawkins, 1996) and Resilience Approach (Bernard, 2004; Schoon, 2006; Werner & Smith, 1982)) are concerned with identifying factors at the community, organisational, family and individual levels which enable or hinder unhealthy behaviours, primarily among children subject to social problems. They are empirically rather than theoretically driven, and so may be restricted to the database on which they are based (i.e., adolescent drug abuse, violence, and delinquency in multi-ethnic communities in the US).

Assessment

Strengths:

- they emphasize the role played by environmental determinants of behaviour
- they maintain a focus on behaviour

Weaknesses:

- unlike the approaches we have dealt with thus far, Multi-Level approaches tend to ignore behaviour, being more concerned with health outcomes (it seems that it is difficult to consider environmental or structural causes and still keep a focus on behaviour; by shifting attention to this large-scale or group orientation, individual-level factors tend to get lost, making this a different style of approach from those that concentrate on the brain-behaviour relationship)
- Multi-Level approaches have also not been widely used or tested, and so require additional exploration to verify their effectiveness
- they typically include a number of types of environmental factors but don't explain how these factors interact to determine behaviour; this is especially crucial if different environmental factors (e.g., social, community, local) are nested within one another (as in the ecological models), so that any influence of higher levels of organisation must filter down through lower ones to have an impact on outcomes

5/ Community-Based Approaches

Some social theorists suggest that the context of behaviour is framed not just by environmental factors that work at the level of individual behaviour, but also by 'structural factors' which can influence entire groups of people to behave in a similar fashion – such as their socio-economic class. Having less money obviously restricts a person's ability to engage in certain activities, whereas being rich broadens one's possibilities. However, social structures can also constrain people's behaviour in ways which extend beyond economic opportunity (Amick, Levine, Tarlov, &

Walsh, 1995; Wilkinson, 2005). For example, middle-class neighbourhoods have proportionally more restaurants, banks, and specialty stores, while low-income areas have more fast food restaurants, liquor stores and laundromats. As a result, it is less easy for those in low-class neighbourhoods to buy specialty items, eat healthy food, or go to a bank. (Trout, 1993) Many therefore believe that changes to group-level factors like social access must be an explicit aim of behaviour change interventions. Table 5 summarizes features of these approaches; Figure 8 shows that this category considers the role of interventions on various aspects of the environmental context of behaviour, but then largely ignores behaviour itself in favour of other outcomes.

Table 5: Community-Based Approaches

APPROACH	BEHAVIOUR CHANGE OBJECTIVE	KEY ASSUMPTIONS	PRIMARY SOURCE	DOMAINS OF USE
Community-Based	*Interventions should be directed at increasing group-level solidarity or introducing/improving organisations to foster desired behaviours*	*Behaviour change can best be effected by directly targeting social groups, and involving them in the planning and implementation of any interventions*		
Community Coalition Action Theory	To create or enhance coalitions such that they effectively implement change programmes which improve community health	Coalitions of community stakeholders are effective mechanisms for implementing changes that improve community health	Butterfoss and Kegler, 2002	general
Participatory Action Research	To involve all relevant parties in actively examining together how some feature of the community can be changed by critically reflecting on its historical, political, cultural, economic, geographic and other contexts	Behavioural change should be emancipatory	Kemmis and McTaggart, 1988	general
Community Building and Organisation	To empower communities by building their capacity to identify, mobilize and address their own problems through structures for community dialogue and civic participation	Communities can be made to increase their competence and problem-solving ability through increased group identification and creation of 'critical consciousness'	Minkler and Wallerstein, 2002	general
Gender and Power Theory	To reduce women's exposure to socio-	Expectations differ between genders with	Connell, 1987	HIV/AIDS

	economic, behavioural and personal risk factors associated with being female	respect to social resources as a result of disparities arising from the sexual division of labour, the institution of patriarchy and reduced expectations		

Figure 8: Community-Based Approaches
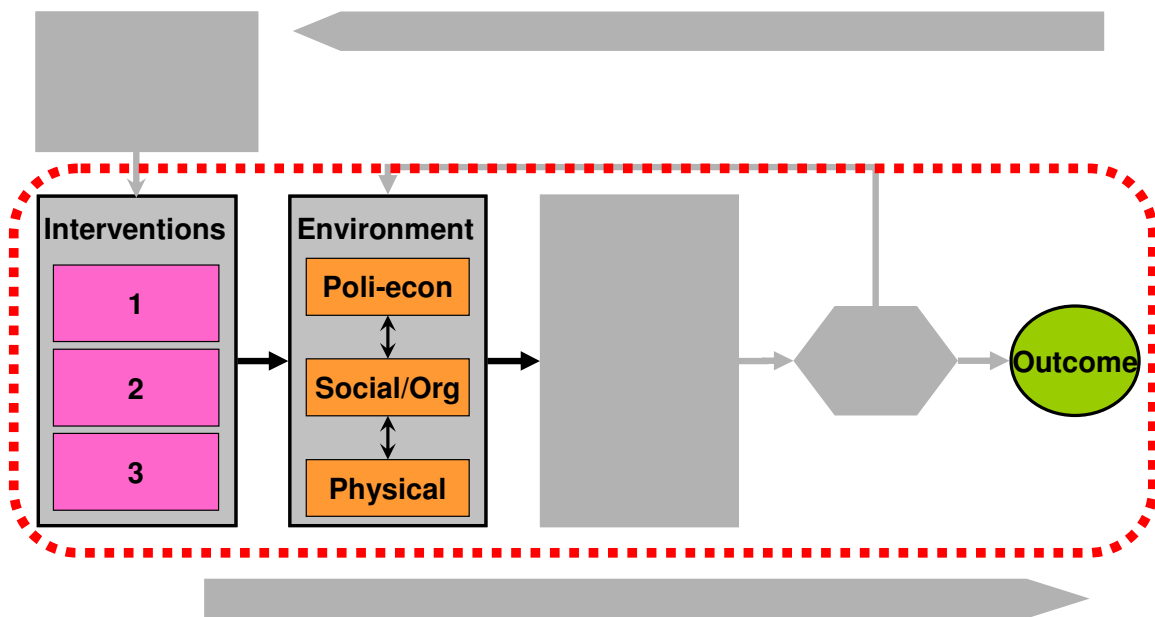
Community-Based approaches are typically based on community participation (Community Coalition Action Theory (Butterfoss, 2006), Participatory Action Research (Kemmis & McTaggart, 1988), Community Building and Organisation (Minkler & Wallerstein, 2002), Gender and Power Theory (Connell, 1987)). They assume that interventions should involve, and be directed by, community members themselves, not external change agents. The community sets the agenda, defines the problems, and finds the means to address them. Early advocates of Community-Based approaches were often social activists who reacted to 'top-down' expert-based interventions by arguing for 'bottom-up' or grass-roots campaigns. The intended result was a levelling of power imbalances between development professionals and local residents. Generally, then, activities centre on reducing socio-structural inequities through the active involvement of community members, representatives of community organisations, and interventionists working together through all phases of the intervention. Emphasis is often on an 'orientation' toward the empowerment of communities, rather than a particular method of interaction with them. (Minkler & Wallerstein, 2002; Ross, 1955) However, different kinds of approaches can still be distinguished by the role taken by the change agents – as leaders or advisors on consensus-building, or advocates with external agencies -- and whether programmes activities are based on community needs or existing strengths.

Advocates of community-level interventions typically believe that if community members participate in each phase of a behaviour change programme -- including development, implementation and evaluation – a sense of ownership is created that increases the programme's effectiveness, presumably because the people affected by a programme are in better position to define and find solutions to their own problems. (Chambers, 1983; Fals-Borda & Rahman, 1991)

Assessment

Strengths:

- the emphasis on community involvement is an admirable moral stance, which other categories of approach can envy
- they can generate considerable political and community support
- they can potentially lead to sustainable, institutionalized behaviour change

Weaknesses:

Recent reviews of such community-led interventions indicate that such programmes have achieved limited results. (Butterfoss, 2006; Merzel & D'Afflitti, 2003; Nilsen, 2006; Thompson, Coronado, Snipes, & Puschel, 2003) This conclusion could arise from a number of causes:

- behaviour or other outcomes actually changed very little
- it is difficult to measure the outcomes targeted by Community-Based approaches, which tend to be factors such as social capital or various measures of community functioning: capacity, solidarity, empowerment or competence
- they focus on process and not outcomes, so such approaches do not achieve as much behaviour change as those that set out to change behaviour explicitly (Communities are not abstractions but organised groups of people; by ignoring what motivates individuals, the proximate cause of any behaviour change, Community Approaches may miss important means of effective intervention)
- the political agenda to reduce social inequalities can be difficult to implement, given that it often requires those at the head of existing power structures to voluntarily give up or reduce their prerogatives
- community-participation programmes can be implemented in geographical areas which don't correspond to functional communities; as a result, there is poor mobilization (Nilsen, 2006) and a lack of reach to the disadvantaged members of communities (Mansuri & Rao, 2004)

All of these difficulties may lie behind the fact that evidence is particularly lacking with respect to the key claim of this class of approaches: that community participation leads to higher programme effectiveness. (Nilsen, 2006) Thus, 'public health partners may have to scale back expectations of what can be accomplished though community participation and collaboration'. (Butterfoss, 2006) [9]

6/ Process Approaches

The final class of behaviour change approaches, according to our framework, are Process Approaches. Process Approaches are theories or models concerned with specifying how the

design and implementation of population-level interventions should take place. They are explicitly concerned with implementation, which is only implicit in many other classes of approach. Process models cover more of the factors in our framework than the preceding models. They can be considered attempts to conceptualize 'best practice' approaches for those seeking to change the behaviour of others (see Table 6 and Figure 9).

TABLE 6: Description of Process Approaches

APPROACH	BEHAVIOUR CHANGE OBJECTIVE	KEY ASSUMPTIONS	PRIMARY SOURCE	DOMAINS OF USE
Process	*To get relevant parties to move through the proper sequence of actions which will result in a good behavioural outcome*	*Going through the right steps will cause behaviour to change at scale*		
PRECEDE-PROCEED	To base public health interventions on a properly executed planning and evaluation process responsive to an appropriate model of behaviour	Public health interventions are more effective if planned properly	Greene and Kreuter, 1991	planning and evaluation
RE-AIM	To improve reach and adoption rate, and to improve programme implementation, efficacy and maintenance	Standardized frameworks for the evaluation of theory-based interventions can help improve theory	Glasgow, Vogt and Boles, 1999	planning and evaluation
Social Marketing	To influence people to voluntarily engage in healthy behaviours	Behaviour can be effectively changed by using a process plan adapted from commercial marketing	Kotler, 2002	general
Johns Hopkins Bloomberg School of Public Health Center for Communication Program 'CODES' Model	To design communication campaigns which influence skills and ideation and reduce environmental constraints	Communication programmes are an efficacious means of achieving behaviour change at scale	http://www.jhuccp.org/research/codes.shtml	public health
Population Studies International 'Bubbles' Model	To maximize opportunities, abilities and motivation and thus increase desired behaviours	Socially advantageous goals can be achieved using commercial marketing techniques	Chapman and Patel, 2004	public health

Process approaches are concerned with intervention planning and evaluation. In this group are the PRECEDE–PROCEED Approach (Green & Kreuter, 1991), the RE-AIM Model (Glasgow, Vogt, & Boles, 1999), Social Marketing (Kotler et al., 2002), the Johns Hopkins Bloomberg School of Public Health Center for Communication Program 'CORE' Model, (http://www.jhuccp.org/research/codes.shtml) and the Population Studies International 'Bubbles' Model. (Chapman & Patel, 2004) As with the Multi-Level and Community-Based approaches, these models tend to ignore behaviour itself, preferring to focus on the health consequences of the large-scale behaviour change expected to arise from well-designed interventions.

Figure 9: Process Model
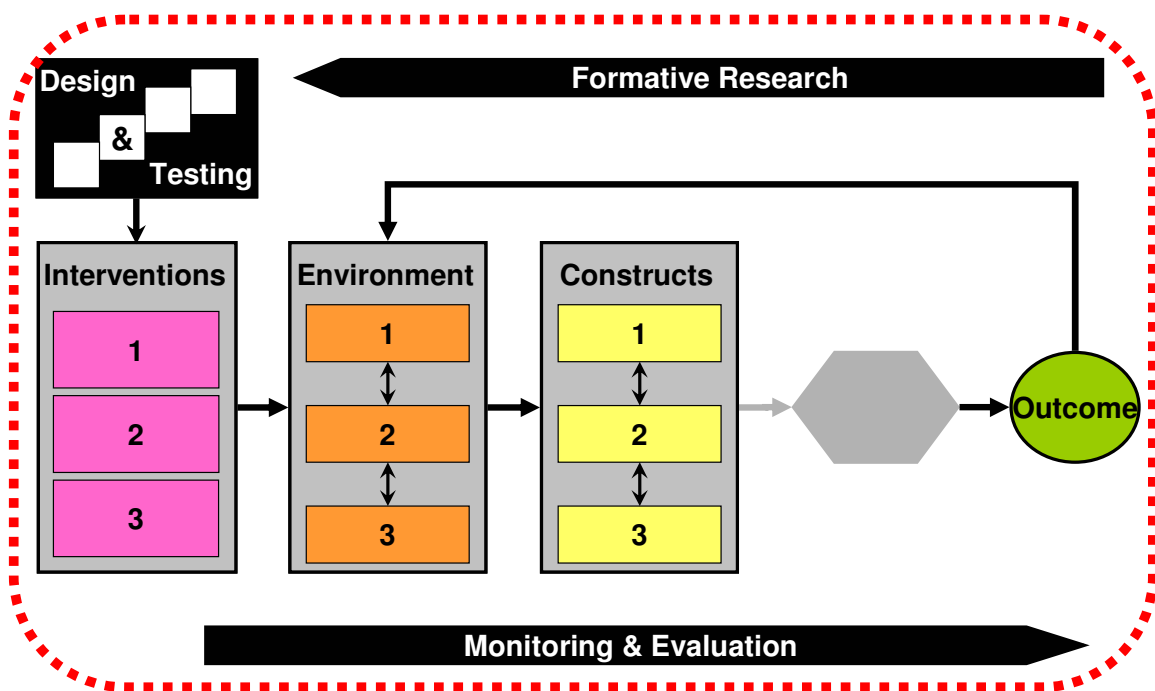
An example is Social Marketing, which is 'the application of the principles and tools of marketing to achieve socially desirable goals, that is, benefits for society as a whole rather than for profit or other organisational goals' (Donovan & Henley, 2003). There are six steps involved in conducting a Social Marketing campaign (Kotler et al., 2002; Malbach et al., 2002):

Step 1: Analysis
      Choose a campaign issue
      Select the target audience
      Review previous research: market analysis, trends,
      Conduct consumer research
      Segment audience based on their needs and characteristics
Step 2: Planning
      Set programme goals and objectives
      Choose programme activities: communication strategy, distribution strategy
      Develop marketing plan: milestones, means of finding out how well the program works
      Determine available resources
Step 3: Develop Campaign Messages and Activities

Develop and test materials and proposed tactics with the target audience
Revise materials until satisfied
Test market concepts/prototypes

Step 4: Implement and Monitor the Plan
Enlist collaborators
Train participants in programme execution
Activate communication and distribution networks
Monitor programme activities

Step 5: Evaluate the Results
Process evaluation of programme materials, delivery
Outcome evaluation to determine how well objectives were achieved
Impact evaluation to determine long-term outcomes (e.g., changes in health measures)

Step 6: Feedback/Refinement
Refine objectives/strategies: uncover problems, identify opportunities
Prepare final report

Assessment

Strengths:

- the most complete kind of approach
- Process approaches are able to direct the design of any intervention programme -- at least in terms of process. This is a major advantage because questions of implementation are central to any evaluation of behaviour change programmes
- it is the first class of approach to include feedback in the form of learning objectives, which should be an intrinsic feature of any behaviour change approach, in our estimation

Weaknesses:

- the relationship between the implementation process in the frame and the behavioural model at the core is not always explicit. In particular, these approaches often do not set out the links between project variables and individual behaviour; they tend rather to evaluate programmes at the population level in terms of health outcomes.
- the various Process Approaches tend not to consider the entire intervention planning and evaluation process identified by our framework.

It would probably be efficacious to combine these approaches to produce what can be called a 'Complete Process' Model that includes formative research and the sophisticated design and testing of interventions characteristic of Social Marketing, together with the use of a behaviour model characteristic of the PRECEDE–PROCEED Model. The Complete Process Model (equivalent to all the components of our general framework) can be thought of as a 'Social Marketing plus monitoring and evaluation' model. This Complete Process Model would allow all aspects of planning and intervention to be rigorously assessed in a consistent way so that knowledge about implementation can accumulate and future programmes can be improved.

The problem with even the Complete Process Model is that the behaviour model at its core is a model of health determination, not of behaviour change. So a truly effective Process Approach would combine concern for both planning and evaluation with the implementation of an

appropriate model of behaviour *change*. Implementation of the Complete (rather than a partial) Process Model is likely to be expensive because it requires both extensive formative research, and monitoring and evaluation procedures. Nevertheless, we recommend its use because it maximizes the probability of showing how both the process model and the behaviour change model can be improved in future interventions.

Discussion

We have now presented all of the major approaches currently used to guide efforts to influence behaviour on a large scale. We have found that they can be efficiently grouped by comparison with a generic framework.

By looking at which aspects of the framework they consider, we can begin to examine how these categories differ from one another. First, the construct-based approaches (which include the Single and Multi-Construct approaches as well as Segmentation models) focus largely on the brain-behaviour relationship, considering psychological factors as the proximate determinant of behaviour. (Sutton, 2004) By contrast, the Multi-Level and Community-Based approaches focus on environmental causes and tend to ignore individual behaviour as an outcome in favour of larger-scale concerns (e.g., community solidarity and population health).

Second, only the Community-Based and Process approaches explicitly deal with interventions -- so much so that they focus on how to engage in interventions to the exclusion of the outcomes. However, where the Process approaches specify a particular sequence of steps for optimal programme design and implementation, the Community-Based approaches leave these decisions to communities themselves, specifying only the objective of community participation. Control over intervention is thus handed over, with the consequence that the particular process used in any given case of implementation of a Community-Based approach is unique to each community.

If we look at the primary goals of the different categories of approach, a further insight about their utility for behaviour change can be gained. Table 7 shows that no category has its primary focus on changing behaviour at scale. Instead they focus on the causes of current behaviour (the construct-based approaches), how to move people from one psychological state to another (the Segmentation approaches), how to remove environmental barriers (which may or may not change behaviour) (the Multi-Level approaches), how to mobilize or create an organisation to produce changes in health (the Community-Based approaches) or how to design and conduct an intervention (the Process approaches). Each of these may sometimes be associated with behaviour change, but it is striking how none of them has as its primary objective behaviour change itself.

Table 7: A Comparison of Categories of Approach

CATEGORY OF APPROACH	PRIMARY GOAL	OTHER OUTPUTS
Single Construct	To identify the relationship between a construct and behaviour	
Multi-Construct	To identify the relationship between a number of constructs and behaviour	Identification of relationships among constructs

Segmentation	To identify sub-populations based on differing suites of psych/environmental factors	Recommendations for moving people between segments
Multi-Level	To identify the influence of environmental barriers on behaviour	Identification of relationships among factors and barriers
Community-Based	To create new organisations or consciousness which can foster change in community health	Community 'empowerment'
Process	To move correctly through a normative process and thus produce significant behaviour change	Behaviour changed at scale; lessons for future interventions; community 'empowerment'

Of course, behaviour change may result from use of any of these approaches. Changing some current construct may cause a new kind of behaviour to be output from a construct-based approach. The output from Segmentation models is a description of population segments, variously defined, with recommendations for how to move people from one segment to another. These movements are primarily psychological, but may result in behaviour change. The Community-Based Approaches are about creating new organisations which can foster change. However, they often do not have an explicit concern for how behaviour will be affected, but are more interested in giving groups a sense of importance and power which will impact on their health. The Process Approaches are unusual in this regard in that their proximate goal is to move correctly through a normative process, but their ultimate goal is explicitly to change behaviour at scale (or at least to have an impact on health or some other outcome through behaviour). For this reason, they can serve as effective and desirable models for behaviour change programmes.

Based on this observation, we believe that use of a 'Complete Process' Model can best guide intervention design and evaluation together with a relevant, authentic behaviour change model to make it effective. The Complete Process Model can be considered to be composed of two independent elements: the implementation process model itself, and the behaviour change model at its core. We can therefore combine our two recommendations into a single one: that the Complete Process Model should be combined with the most relevant, authentic behaviour change model that is consistent with what formative research shows to be the best target for behaviour change.

However, this is still not an ideal approach to behaviour change because at present we only have a few, rather fragmentary approaches to behaviour change. Though many of the approaches we have reviewed claim to be general or all-purpose models of human behaviour none cover all of the territory of the framework we set out here. For example, operant conditioning is considered by its advocates to be a general theory of human psychology (Skinner, 1938), but it ignores the complexities of motivation and cognition – that is, the inability of people to learn anything equally easily due to innate structural constraints on conditioning. (Seligman & Hager, 1972) There is thus a need to develop more general models focused explicitly on behaviour change. This will require investment in finding out which constructs identify real psychological mechanisms. Many of the constructs used in the approaches we have covered have been validated statistically – that is, in terms of their ability to be reliably measured. They have also regularly been found to correlate significantly with the practice of a particular behaviour. However, this does not necessarily mean that they are the best possible constructs, because they may overlap with -- but not pinpoint – the real psychological mechanisms that produce behaviour. Theoretical work as

well as empirical testing will be required to isolate, measure, and find means of targeting, these mechanisms for truly effective behaviour change.

Conclusion

Though there have been attempts to review models and to reach professional consensus about behaviour change, such attempts have been more democratic than critical, and the solutions they offered have generally not been taken up by practitioners. In this paper, we have provided a synthetic framework for developing behaviour change programmes which we hope will prove more useful. Our framework assumes that health is influenced by behaviour; that behaviour is determined by psychological entities or 'constructs' in the brain and also by the environment; and that interventions can hope to affect either, or both, brain and environment, and so affect behaviour. The framework also sets out the processes that practitioners can follow to design and evaluate behaviour change interventions. We believe this framework to be not only simple but complete. We demonstrated its completeness by showing how any behaviour change approach uncovered by a quasi-systematic review of literatures in health psychology and marketing can be clearly and uniquely placed within our framework. In particular, we assigned each theory to a class depending on the parts of the framework they set out to explain. Six classes of approach were identified in this way. Finally, we critically evaluated the different classes of approach to behaviour change – a kind of critique only made possible by the ability to compare theories against a standard. The availability of this framework should make consolidation of theory easier in future.

Our use of the framework to review the literature on behaviour change provided a number of insights. First, a large number of theories are concerned with the determinants of behaviour, not with the determinants of behaviour change. Understanding what causes people to behave as they currently do will not necessarily provide a good foundation for pinpointing how best to get them to do something else. This is a very important distinction which seems to be widely ignored.

Second, some theories within the class of construct-based models appear to have had notable successes in changing behaviour (such as the Social Norms Approach and Implementation Intentions). We suspect that this is because they have been more successful in identifying real mechanisms in brains that correspond to some natural function that produces behaviour, coupled with the fact that these mechanisms can easily be manipulated by means available to behaviour change interventionists. Thus, the Locus of Control and Social Norms approaches both have the virtue of simplicity, being Single Construct Approaches, but the Social Norms approach might be more effective because it identifies a real motivation which all people are likely to have and automatically engage in: the need to be similar to others. On the other hand, increasing an individual's perceived control doesn't necessarily lead to behaviour change because people also need motivation to engage in the desired behaviour – the motivation is not 'built in' to Locus of Control. This does not mean that behaviour change theories have to be complex; indeed, once psychologists have gained better knowledge about how the brain works, approaches to behaviour change could become much simpler.

Third, though much evidence has been published for the effectiveness of interventions based on a given model, this still does not allow us to determine which model is the best overall approach. This is because health researchers have usually been advocates for one or another model and have not set out to make comparisons between models. We therefore advocate the development of methods of testing different approaches against one another. In particular, a variety of small-

scale experimental methods could be used as test-beds for uncovering what works to convert people from non-practitioners to practitioners. One means might be to compare different kinds of interventions through small-scale behavioural trials to determine which kinds of intervention lead to the largest change in practice of the desired behaviour, with pre- and post-testing of motivational, cognitive and situational factors of subjects to determine what the proximal determinants of the change in behaviour were.

Finally, we have recommended that a Complete Process Model be the tool of preference because it explicitly recognizes every component of behaviour change within a parsimonious framework. We believe these insights will go some way in helping interventionists to design more effective programmes in future.

Comparison of the literature on behaviour change with recent work in the brain sciences also suggests major lacunae in current approaches. First is the absence of consideration for both motivated and automatic behaviour in nearly all of the approaches we have covered. Motivation has been relatively neglected in theory, perhaps in part because it has been replaced in the concerns of mainstream psychology by the focus on higher-level cognitive (executive) constructs. As a consequence, theorists in health education and its successor, health promotion, demonstrate a bias towards the cognitive or rational, tending to assume that most behaviour is under conscious, volitional control and can therefore best be influenced by rational argument. In other words: because conscious reasoning is more accessible to theorising, theories of behaviour change, as well as common-sense approaches, have tended to focus on rationality and less on the unconscious determinants of behaviour.

Habits – or learned automatisms – are also an important type of behaviour. By one measure, about half of our everyday activities are performed habitually, including reading a newspaper, eating meals, driving a car, and exercising. (Quinn, Neal, & Wood, submitted) It is also the case that many behaviours of interest to public health workers are likely to be performed habitually, such as having sex, eating, substance abuse, driving, and inadequate physical activity. It is therefore quite shocking to realize that the construct of habit has appeared in only one of the approaches we have discussed (the Theory of Interpersonal Behaviour), and then only as one of the determinants of any behaviour, rather than recognizing that habits have an altogether different kind of causation than executive or motivated behaviours. Habit performance is cued by the environment, so changes to beliefs and attitudes -- for example, through informational or persuasive messages -- have little effect on health-related behaviours likely to be performed habitually. (Webb & Sheeran, 2006) This obviously has significant implications for behaviour change interventions. Successful programmes to change habitual behaviours will have to rely either on changing the environmental context of behaviour – for example, through building sidewalks to promote exercise or policies that reduce access to unhealthy products, (Verplanken & Wood, 2006) or techniques for challenging people to develop cognitive plans specifically designed to instigate new habit formation – that is, implementation intentions (Verplanken, 2005).

Further, no approach considers the fact that brains are encased in bodies. The field of 'embodied cognition' has shown that many fundamental mental processes – from counting to notions of self – are influenced by the fact that the brain is housed inside a body with particular perceptual and motor capacities. In effect, the brain and its body are a tightly coupled system engaged in real-time interactions with its environment designed to enable it to survive. (Clark, 1997; Varela, Thompson, & Rosch, 1991) In particular, our thinking (as reflected in language at least) is built largely on metaphors from our embodied situation. For example, the instruction 'go to the back of the house' is based on the view of our bodies as having distinct fronts and backs, because our

eyes face in one direction. (Lakoff & Johnson, 1999) The brain even off-loads some of its cognitive work onto the environment. For example, people use paper and pen to help them perform lengthy calculations which it would be difficult to keep in memory. (Hutchins, 1995) We believe that motivation, habit and the embodied nature of thinking should be given significantly more attention by behaviour change theorists and practitioners.

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Notes

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[1] We define the following technical terms as follows:

- **Theory**: a set of related statements or principles devised to explain a group of facts or phenomena. (Kerlinger, 1986) These related propositions make phenomena comprehensible by describing the relevant structure, operation and circumstances under which they occur.
- **Model**: a simplified description of a complex entity or process. Models allow complex systems to be understood and their behaviour predicted within the scope of the model, but may give incorrect descriptions and predictions for situations outside the realm of their intended use. A conceptual model can be a component of a theory that represents some process or phenomenon with a set of variables and a set of logical and quantitative relationships between them.
- **Approach**: describes a model or theory which has been used as the method of dealing with the problem of large-scale behaviour change by some group of people (such as psychologists or public health workers) and hence has a tradition in the behaviour change literature
- **Construct**: an abstract concept used to describe a mental faculty (e.g., motivation, self-efficacy). In practice the component constructs of the brain remain unknown, and exist only as hypotheses.

[2] A cross-theoretical review shows that there are significant differences in the degree of success of media-based health campaigns in the United States depending on what kind of behaviour is targeted: getting people to use seat belts being relatively easy, while sexual behaviour is much harder to change. {Snyder, 2004}

[3] The participants in this workshop also argued that five other variables are key in determining the strength of intention: belief that the advantages outweigh the disadvantages (costs, outcome-related factor valuation), perception of social normative support for the behaviour, consistency of behaviour with self-image and personal standards, positive emotional valence, and a perception of self-efficacy.

[4] Fishbein used his experience in the 1991 NIMH workshop to devise an integrated theoretical model which uses many of the constructs identified as important by this workshop as key determinants of behaviour (Kasprzyk, Montaño, & Fishbein, 1998; Montano, Kasprzyk, Haeften, & Fishbein, 2001). This model augments his more familiar Theory of Planned Behaviour (see below), but still without explicit consideration of environmental determinants or skills. To our knowledge, no one has used the consensus model from the evidence-based practice group in empirical work.

[5] To maximize the comparability between approaches, we have focussed as much as possible on graphical representations or explicit models associated with each approach, not on descriptions of their theoretical foundations, possible interpretation, or how they are used by practitioners, which can vary significantly. Many examples of these models can be found in the Powerpoint presentation that accompanies this report.

[6] The approaches eliminated from review include the following:

- The Precaution Adoption Process Model, (Weinstein, 1988) Natural Helper Approach, (Collins & Pancoast, 1976; Israel, 1985) Interactive Mapping Approach, (Bartholomew, Parcel, Kok, & Gottlieb, 2001) Self-Determination Theory, (Deci & Ryan, 1985) Social Capital Theory, (Putnam, 1995) and Prevention Marketing (Kennedy & Crosby, 2002) because they overlap significantly with the better-known Stages-of-Change approach, (Prochaska & DiClemente, 1983) Social Network and Social Support Approach, (Heaney & Israel, 2002) PROCEDE-PRECEDE Model, (Green & Kreuter, 1991) Intrinsic Motivation Theory, (Deci, 1976), Social Networks and Social Support Approach, (Heaney & Israel, 2002) and social marketing approach (Kotler et al., 2002), respectively.
- Authoritative Parenting Theory (Simons-Morton & Hartos, 2002) and the Sensation-Seeking Approach (Zuckerman, 1979), because they target constructs (parenting styles and sensation seeking, respectively) which are psychobiological (i.e., personality) characteristics not amenable to manipulation, and so not a ground on which a behaviour change programme can easily be built.
- Organisational Theory (Steckler, Goodman, & Kegler, 2002) and Person Situation Contingency Models (Fiedler, 1967) because they are too specifically tied to the context of within-organisational change for general use in large-scale behaviour change programmes (the latter being about matches between leadership and organisational culture, and so very specific indeed).
- The Interactive Domain Model (Kahan & Goodstadt, 2001) because it consists of a dynamic collection of 'best practices' for devising public health interventions (i.e., a collection of techniques and models borrowed from other approaches).
- The Communication-Behaviour Change Model (Finnegan Jr & Viswanath, 2002) because it is not sufficiently well-distinguished from media studies in general, and so cannot be made to make specific predictions. The primary effect of communication on behaviour is, in any case, taken care of by the Social Influence Approach. (Lewis, DeVellis, & Sleath, 2002)

[7] This position can be justified by the assumption that psychological factors are the proximal determinants of behaviour, so that any environmental influences have to feed through the brain. (Sutton, 2004)

[8] This description combines the characteristics of the 'behavioural ecological' model associated with scholars at San Diego State University (Hovell, Wahlgren, & Gehrman, 2002) and the 'social ecological' model with partisans at the University of California, Irvine (Stokols, 1992, 1995). The behavioural ecological model differs in having its theoretical foundation in operant conditioning as applied to a 'hierarchy of interacting reinforcement contingencies', but this theoretical foundation was not deemed to make the models sufficiently different to warrant separate treatment here.

[9] The possible exception to this record of relatively poor achievement is HIV prevention programs. In HIV/AIDS the number of interventions and scientific reviews and meta-analyses of them are probably more advanced than in any other area of public health. Here, empirical evidence is strong for the effectiveness of several kinds of interventions: small-group behavioral interventions, counselling and testing, community-level interventions, and structural-level interventions such as workplace programs (Schwartlander et al., 2001; Valdiserri et al., 2003) In

this case, individual- (including counselling and testing), group-, and community-level behavioural interventions appear to effect changes in HIV-related risk behaviours.

How can we explain this discrepancy between a general sense of ineffectiveness and good evidence for effectiveness in this case? Possibly, HIV/AIDS has certain advantages as a target for community-level intervention: HIV/AIDS tends to be better funded than other areas of public health concern, due to its deadly epidemic quality; it therefore has implemented a larger number of projects, which provides a larger base of evidence, some of which is bound to be positive. Even so, there appears to be a common-sensical trade-off between very intensive or costly interventions and effectiveness, suggesting that the best HIV behaviour change interventions are small-scale in nature. (Lyles et al., 2007) The implication is that Community Participation approaches may be difficult to scale up.