Expert Testimony – The effectiveness of physical activity promotion interventions

Introduction

The aim of this paper is to present a summary of the evidence of effectiveness of physical activity interventions for the NICE CVD PGD. This paper has been requested by the PDG and will focus on single risk factor interventions delivered at a policy or population level that are relevant to CVD prevention.

Background

Physical activity is a behaviour made of a number of different types of activities. These activities are usually divided into five domains: occupational, leisure time physical activity (swimming, dancing, walking and cycling), sport and exercise, transport activity (walking and cycling), household activity (chores, gardening, DIY). Physical activity can be assessed in five different dimensions (i) frequency of participation, typically expressed as number of sessions per day or week, (ii) intensity, usually expressed as light, moderate or vigorous, (iii) duration – time spend on a single bout of activity, (iv) type or mode – qualitative descriptor such as brisk walking, dancing or weight training, and (v) a summary of the total amount or quantity of physical activity, usually over a specified period (Department of Health, 2004). Physical activity interventions can focus on specific domains of physical activity e.g. active travel or on increasing overall levels. Accurate measurement of physical activity remains a challenge for researchers. Epidemiological studies of physical activity have clearly demonstrated a reduction in risk with increasing levels of physical activity with mortality and morbidity associated with CVD, cancers, cognitive and mental health (Department of Health, 2004; World Cancer Research Fund / American Institute for Cancer Research, 2007). Other positive outcomes of increasing physical activity are claimed including reduction in carbon use, crime, and increases in social capital. The cost of physical inactivity for PCTs in England is estimated to be more than £700 million in 2006/07 (Department of Health, 2009).

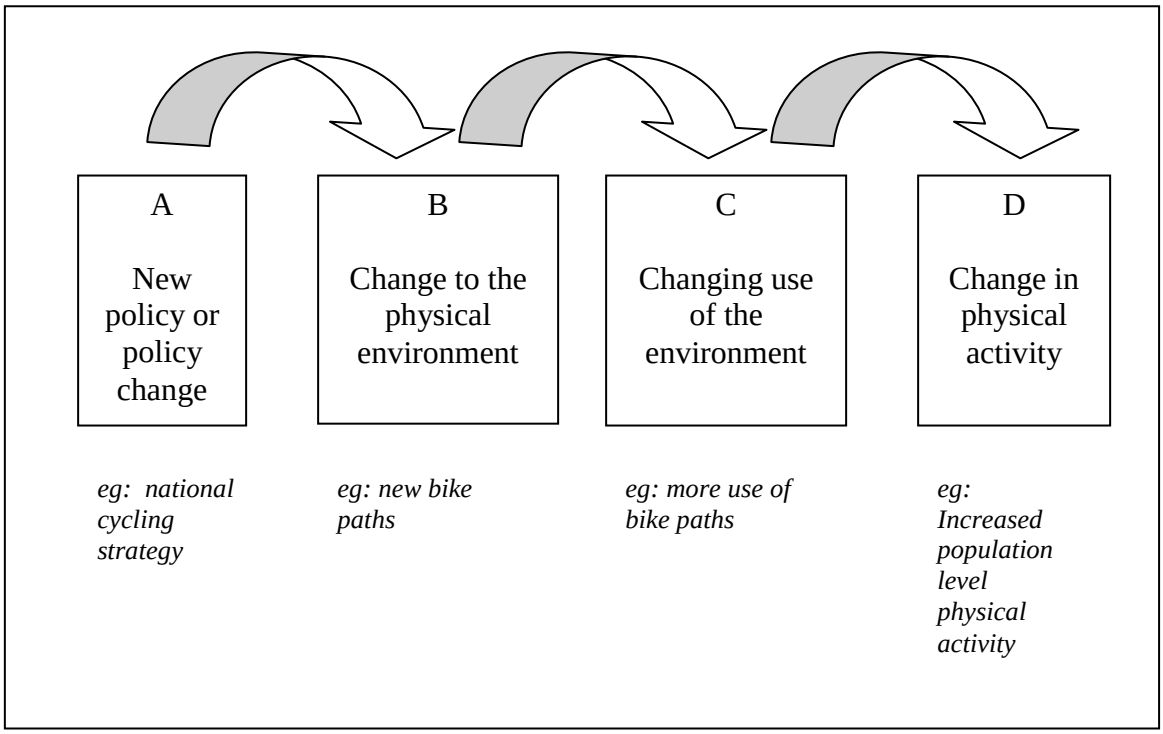
What types of physical activity interventions exist at policy or population level?

Much of the evidence base for the effectiveness of physical activity interventions is for small-scale interpersonal or group interventions. It has been said that this demonstrates the inverse evidence law in which there is the least evidence about the approaches that we think might have the greatest potential. However, due to the PDG's focus on policy and population-level interventions, this testimony will focus on three categories of physical activity interventions: (i) policy interventions, (ii) environmental change interventions and (iii) community-based interventions.

There is a natural link between policy and environmental interventions. However, much of the literature tends to conflate the two issues of an environmental change (such as the building of a new bike path) with the policy change that preceded it (such as a cycle strategy or similar statement setting out the intention to promote cycling through building more bike paths) (Cavill and Foster, 2007). The vast majority of these studies do not specifically isolate the policy component of these interventions, but focus on the actual change to the physical environment. This makes it difficult to tease out the specific

effect of any policy change. This testimony deliberately separates the two issues and ensures that the focus is on the components of public policy that might support effective interventions to promote physical activity through environmental change, or will provide a favourable background to the promotion of physical activity. This is illustrated in Figure 1, which shows a conceptual model of how policy on the environment might be seen to influence levels of physical activity. Much of the 'policy and environment' literature identifies changes in physical activity (box D) or use of a specific aspect of the environment (box C) that have arisen due to a change in the physical environment (box B). But studies rarely look at the policies that led to these changes in the first place (box A).

Figure 1 Conceptual model of physical activity promoting policy and the environment



Since the late 1990s, UK policy documents have made reference to the role of the environment in promoting physical activity. As long ago as 1998 the New Deal for Transport (Department for Transport, 1998) was the first to recognise the impact that transport had on health. In later documents such as *Choosing Activity: a physical activity action plan* (Department of Health, 2005), the environment was recognised as a means or setting for promoting physical activity.

The effectiveness of policy interventions to promote physical activity

The published literature on the effectiveness of policy interventions to promote physical activity is sparse. (Cavill and Foster, 2007). Three policy approaches were found (i) national policy on health and physical activity (Vuori, 2004), (ii) national transport policy

(Pucher and Djikstra 2000) and (iii) national/ Regional planning policy (Schwanen et al, 2004).

The evidence from one national policy study suggested there may be an association between national policies on physical activity, which include a focus on improving the environment, and increased recreational physical activity and sport.

The evidence from one national transport policy study suggested there may be an association between national transport related policies that include an environmental modification component and improved levels of walking and cycling compared to countries without such policies.

The evidence from one national/ Regional planning policy study suggests there may be an association between national spatial planning policies and levels of walking and cycling, particularly in more urbanised areas.

Other systematic reviews have reported evidence to support the gradual impact of policies to support a range of active travel initiatives, delivered at a city wide level, to increase population levels of cycling and walking, e.g. Copenhagen, Odense, Amsterdam and London. (Ogilvie et al, 2004; Ogilvie et al, 2007; Nice, 2007). However evaluations of these interventions are hampered by design, quality of outcome measure and dilution of effects across a population. Finally the Agita Sao Paulo programme combined policy, environmental and community based physical activity initiatives to produce an intervention that delivered actions at each section of a socio-ecological model for different population groups. The evaluation of this programme over six years using random stratified population samples (pre/post design) has reported increases in walking, moderate levels of physical activity and knowledge of physical activity and the programme itself (Matsudo et al, 2004).

The effectiveness of environmental change interventions to promote physical activity

NICE have recently published public health programme guideance on physical activity and the environment and this data will be presented separately to the CVD PDG (PH8 – NICE, 2008). Other systematic reviews have also found some evidence to support the impact of large scale environmental changes on physical activity (Foster et al, 2006; Ogilvie et al, 2007). Studies included (i) provision and improvement of sports and exercise facilities, (ii) change to policies to encourage adults to have greater access and time to use new facilities, and (iii) the construction of new local opportunities to walk and cycle using cycling and walking paths. Five of the six studies reported a small effect of their interventions in increasing physical activity levels either as a direct change in self reported physical activity, cardiovascular fitness or trail usage (Linenger et al, 1991; Peel and Booth, 2001; Vuori et al, 1994; Merom et al, 2003; Gordon et al, 2004). Two studies demonstrated that a combination of changes to working practices, policies and the physical environment encouraged adults to maintain their vigorous physical activity and fitness (Linenger et al, 1991; Peel and Booth, 2001). These studies suffered from similar methodological limitations seen in the policy interventions section.

Despite the appeal of changing the environment or providing new opportunities for physical activity (e.g. cycle paths), the evidence base for these approaches in terms of promoting physical activity is small. Some evidence does exist of an effect upon physical activity behaviour in the short term but this evidence base is weakened by the poor quality of study methodology.

The effectiveness of community-based interventions to promote physical activity

Community-based physical activity interventions can span a range of different types of physical activity interventions, delivered across different settings (Cavill and Foster, 2004). Community is often defined as a geographical area, such as a city or town, defined by geopolitical boundaries (Sharpe, 2003) however we feel it could also include dimensions related to race, culture, ethnicity, age and gender. One advantage of community interventions is they tend to use a "seeking stance" (King, 1998), where the health promoter actively seeks out the target community. This contrasts with a "waiting stance" for example adopted by health care professionals who respond to the needs and demands of people using their service.

For this testimony we categorised these interventions into three groups, (i) comprehensive integrated community approaches, (ii) community-wide campaigns using mass media, and (iii) community-based approaches using person-focused techniques. These interventions used three types of outcome variable (i) proximal variable (changes in knowledge, self efficacy, awareness, (ii) intention to be more active, and (iii) changes in self reported physical activity.

Community integrated approaches included actions across arrange of settings. Three large cardiovascular health programmes the Minnesota Heart Health Project (Luepker et al, 1994), the Stamford Five City project (Young et al, 1996) and the Pawtucket Heart Health Project (Eaton et al, 1999) include physical activity as a focus of their actions alongside healthy eating and smoking reduction. Change in physical activity across these programmes could be described as modest at best with small and unsustained changes in physical activity. Other process measures from these programmes showed high levels of participation in community events and that mass media campaigns increased awareness and knowledge, while the longer-term setting-specific programmes contributed more to increased physical activity (King, 1998; Blake et al 1987).

Community-wide campaigns using mass media have produced significant changes in proximal variables. Reviews have shown that mass media approaches alone are effective at raising awareness of physical activity messages, but have little long-term impact on behaviour (Kahn et al, 2002, Marcus et al, 1999). Evaluation of such approaches is limited as it tends to focus too much on behaviour change, without measuring any changes in the proximal variables – such as knowledge or attitudes – which are more amenable to change through communication campaigns (Cavill and Bauman, 2004). The Active for Life campaign, run by the Health Education Authority, reported similar findings with significant changes in knowledge about the new physical activity recommendations, increased significantly after the campaign but no changes seen in physical activity.

One recent example of a successful mass media campaign – Project VERB has reported changes in knowledge, attitude and physical activity. In 2001, US Congress gave $125 million to the Centre for Disease Control to launch a campaign that would help children develop habits to foster good health over a lifetime and to use methods that are employed by the best kids' marketers. The funding was the largest ever given to CDC for a single initiative, and the style of promotion was different from previous attempts to increase young people's physical activity. VERB went on to become the largest youth campaign conducted in the world, focusing on "tweens" (9-13 year olds). It is particularly important for consideration by the PDG as it was very comprehensively evaluated using formative, process and outcome evaluations. These evaluations reported that the more children who reported seeing VERB messages, the more physical activity they reported and the more positive their attitudes were about the benefits of being physically active. Selected communities received 'high doses' of advertising and special campaign activities. These were compared with a comparison group that received only the national dose of advertising. After 2 years, tweens in the high-dose communities reported higher awareness and understanding of VERB, greater self-efficacy, more sessions of free-time physical activity per week, and were more active on the day before being surveyed than tweens in the comparison group who received the average national dose. Parents' awareness of VERB was associated with positive attitudes, beliefs, and behaviour. The links to communities were thought to be particularly important: the campaign used a social marketing approach to deliver its message through the mass media, school and community promotions, and partnerships (Wong et al, 2008; Asbury et al, 2008).

The effectiveness of community-based approaches using person-focused techniques

This category included programmes that use methods and strategies such as one-to-one counselling, classroom instruction, and cognitive-behavioural strategies, but use them in community facilities and settings such as church halls or community centres. (Sharpe et al, 2003). These approaches have reported significant changes in physical activity, sustained up to one year (Foster et al, 2008; Ogilvie et al, 2007; Ogilvie et al, 2004). Characteristics of successful interventions include those tailored to people's needs, targeted at the most sedentary or at those most motivated to change, and delivered either at the level of the individual (brief advice, supported use of pedometers, telecommunications) or household (individualised marketing) or through groups, can encourage people to walk more. Interventions which provide people with professional guidance about starting an exercise programme and then provide on going support may be more effective in encouraging the uptake of physical activity.

Limitations of evidence base

There are several key limitations to the evidence base for physical activity, shared equally in research into other CVD risk factors. These relate to measurement, study design, expense, population sample, applicability to the UK from international work and differential effects on different population groups. Most importantly there appears to be reluctance amongst agencies to pay for high quality outcome and process evaluation of such approaches.

What community based approaches have not been included in this testimony?
We have not included in this testimony data on the effectiveness of interventions based in community settings in areas that have been previously reviewed by NICE. These approaches include the promotion of physical activity in the workplace, intervention based in primary health care, interventions to promote physical activity in children. Other community-based physical activity approaches (not yet evaluated by NICE), and are currently underway in the UK include (i) provision of free swimming and/or free sports centre access, (ii) discounted or free public transport provision for children or the elderly, (iii) the use of local authority regulatory, legislative and policy guidance on physical activity promotion, (iv) the impact of combined programmes to tackle healthy eating and physical activity together at a community level, (v) the recruitment of those in most need to participate in community based physical activity programmes.

Conclusion
It is clear that the population level problem of sedentary lifestyles requires a population-level solution. This is the only way to affect social norms to make a physically active lifestyle more acceptable and 'normal' part of everyday life. However, the review-level evidence for the effectiveness of community interventions to promote physical activity remains equivocal. While the larger-scale community programmes have had some positive results, they have not tended to demonstrate population-level impact. More positive results have been seen from the smaller-scale programmes which have taken behaviour change techniques more normally used in health behaviour change, and translated these to the community setting. There also appears to be some positive impacts from the types of community 'campaigns' which use highly visible intervention approaches alongside community activities. The scale of intervention may be one of the most important components in determining the success of the community approach. Targeting large communities runs the risk of having little population-level reach. Too small, and the interventions may work, but among a small sub-set of the population. It appears that the central challenge will be to get this aspect right, and to successfully apply behaviour change techniques developed in one-to-one approaches to broader community-wide programmes. Appendix 1 outlines and describes the key elements of successful community based physical activity interventions plus a conceptual framework for these approaches.

Two challenges remain yet unresolved for physical activity promotion (Ogilvie et al, 2007; Foster et al, 2008). Firstly we remain unsure about the contribution of increasing inequalities by the current provision of physical activity promotion services. Secondly it is likely the evidence base for physical activity will continue to suffer from the inverse evidence law whereby to date we know least about the effects of interventions most likely to influence the health of the largest number of people.

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Appendix 1 Implications for planning and running community interventions

Extract from Cavill N, Foster C. How to promote health enhancing physical activity: Community interventions. In: Oja P, Borms J, editors. Health Enhancing Physical Activity. Perspectives Vol. 6. London: Meyer & Meyer Sport; 2004, pages 384-385.

The evidence base for the effectiveness of community interventions to promote physical activity is still relatively small. The disparity of approaches makes it difficult to draw strong conclusions about which components of a community approach should be recommended. However, we do offer some general guidelines to those considering designing a community intervention. This is also shown in Figure 2.

i) Define an appropriate community
A community must have something that draws it together – whether it is a common place, religion, belief system, age or gender (or combination of all of these). The stronger the community cohesion, the more you can build on to develop social support and change social norms. The community's size is important, and should determine the methods to be used. A small community intervention can exploit face-to-face communications and informal networks while a larger one will need to make more use of mass media.

ii) Build a community coalition
Forming a community coalition can be an excellent way to bring together the key players and build momentum for community change (King 1998). A combination of effective leadership and strong community organisation can enhance the programme and lead to greater levels of participation (King 1998). It can also help to be the voice of the community, ensuring that community needs, assets, and preferences are assessed (Sharpe 2003).

iii) Secure funding for a long-term programme of sufficient intensity
Programmes appear to have suffered from reduced penetration into the target community, no doubt mainly due to insufficient funds. Community change is a slow process, and co-ordinated efforts need to be sustained over years rather than months.

iv) Use multiple-level strategies
The ecological model provides a useful framework for programme planning, if only to serve as a reminder that multiple level strategies should be used rather than putting 'all your eggs in one basket'. A truly integrated community programme would therefore include strategies at environmental, legislative, fiscal, policy, community, family and individual levels. These could also be phased sequentially - for example, using individual behaviour change programmes to build demand for walking, and then working with the new walkers to lobby for environmental changes.

v) Build on behaviour change theory
Cognitive-behavioural strategies appear to offer the most potential for community interventions. In particular, the application of the Transtheoretical model has been effective in increasing activity levels – at least in the short term. (Sharpe 2003). Tailoring

of messages should be as sophisticated as possible, taking account of the views – and 'stage of readiness to change' of the target audience.

vi) Use media only in conjunction with community activity

Current evidence does not support the use of media alone, but does support the use of media when combined with community activity. Media can be used to support and promote existing activities as well as general awareness-raising.

vii) Evaluate, evaluate, evaluate.

A common challenge across the studies was evaluating the impact of the different elements of the programmes. The evaluation approaches used often lack the ability to determine the true effect of the programme upon the target community. Repeated measurement of physical activity behaviour is prone to "regression to the mean", where the high active can only decrease and the sedentary can only increase their physical activity behaviour.

Selection bias can occur with the means of selecting which parts or individual within the community to evaluate resulting in differences between groups. Finally activities within one area might attract or spill over into other areas, so that the effect of the programme is diffused or imitated. These problems of internal validity can be overcome with different evaluation designs. An excellent example of a strong design is the evaluation of the New South Wales (NSW) state-wide physical activity campaign in Australia, which combined a quasi-experimental design with independent population samples (Bauman et al 2001). Evaluations of community interventions are limited not only by design but also by resources. These resources include funds to pay for appropriate evaluations, e.g. data collection and analysis, the skills of the programme workers in evaluation, and the political nature of large scale community interventions, which tend to state that "it must appear to be working". Untangling the mix of different components used within a community intervention is crucial if we are to identify the effort to develop and implement these different components. Process evaluation and cost analysis will help to clarify what was done, at what cost, to whom, with what results. If the effectiveness of community physical activity interventions are under scrutiny then only stronger, better designed and well funded evaluations can resolve this issue. This is shown in Figure 2 where it suggested that some form of process evaluation should be carried out at every stage of the project's development, before continuing.

Figure 2 Guidelines for designing a community intervention (Cavill and Foster, 2004, p388)