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# Strategies and settings for improving physical activity and nutrition: rapid reviews

An **Evidence Check** Review  
brokered by the Sax Institute for the  
NSW Department of Health

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**Suggested Citation:**

Strategies and settings for improving physical activity and nutrition: *Evidence Check* rapid reviews brokered by the Sax Institute (<http://www.saxinstitute.org.au>) for the Centre for Chronic Disease Prevention & Health Advancement, NSW Department of Health; (2006).

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**A****Relative effectiveness of the workplace as a setting for identifying individuals at risk of chronic disease prevention.****Rob Sanson-Fisher, University of Newcastle****Adrian Bauman, University of Sydney****Headline review question**

What is the evidence that the workplace is an effective setting for identifying individuals at risk of chronic disease like diabetes using self report measures? What is the evidence about the relative effectiveness of the workplace compared to primary care or community settings?

**What does the evidence say?**

The identification of people at risk of diabetes will be most effective in settings where: (i) most of the at-risk population can be found (access); (ii) people are likely to respond accurately to questions about risk; (iii) risk identification programs can be readily implemented; and (iv) there is an easy link to later intervention programs.

People at risk of diabetes are more likely to be from lower socio-economic groups<sup>1</sup> and over 45 years of age.<sup>2</sup> Indigenous people are at particular risk of diabetes.

We were unable to locate any studies that compared the effectiveness of the workplace as a setting to identify individuals at risk of diabetes with that of primary care or the community.

**Workplace as a setting for identifying those at risk of diabetes**

There is relatively little information about the effectiveness of screening for risk factors in the workplace.

**Access:** Sixty five percent of the Australian population aged over 15 years are in the labour force.<sup>3</sup> There are certainly individuals with significant risk levels in the workplace; according to the ABS, 22.6% of workers smoke, 15.7% are risky alcohol consumers, 50.4% are obese or overweight and 68.5% are sedentary or engage in low level exercise.<sup>2</sup> The workplace may provide good access to middle aged males – these are a key target group for screening; however, indigenous Australians and low socio-economic groups are at greater risk of type 2 diabetes, but have higher levels

of unemployment than other Australians.<sup>2,4</sup> It is therefore possible that screening programs in the workplace will miss many individuals at risk.

**Accuracy of self report:** Self report surveys of populations of workers have tended to show low response [participation] rates and also less reliability in self report measurement. Employees may be unwilling to disclose lifestyle behaviours, such as smoking or alcohol consumption, to their employers and there is some evidence that employees are more likely to give socially desirable responses when questioned in the workplace setting.<sup>5-8</sup> The alternative, carrying out objective measures or interviews in the workplace to assess obesity, or interviewer administered protocols to define physical activity and diet levels, would be too time intensive for a health professional such as an occupational health nurse.

For screening in the workplace to be effective, there would need to be an investment in ensuring accurate measures of physical activity and diet, particularly in blue collar workers. One key issue is to make sure that occupational physical activity is captured and there has been no assessment of the reliability of self reported dietary measures in blue collar workers.

**Feasibility of widespread screening:** It is likely to be difficult to implement systematic screening programs through the workplace. Many employers feel that health promotion is not part of their role or responsibility, and complain about loss of productivity when workers stop work to participate in screening or intervention programs.<sup>9</sup> Small businesses account for 95% of the workplaces in Australia,<sup>10</sup> the number of individuals who can be accessed via each business is less than 20; in total, 32% of the employed population works in small business. While many small businesses may be part of associations, such as chambers of commerce, gaining access to an adequate number of businesses to allow clinically significant outcomes may be difficult.

**Intervention:** (see also Question 2) The evidence that effective programs to change health behaviour can be delivered through the workplace is equivocal.<sup>11</sup>

#### Primary care as a setting for identifying those at risk of diabetes

There is somewhat more information about screening for chronic disease in primary care.

**Access:** Primary care provides an excellent access point for people with risk factors for diabetes. Approximately 85% of the Australian population will visit a general practitioner (GP) at least once a year and most will visit within a 20 month period. Women are more likely to be represented as general practice patients (57%);<sup>2</sup> however even middle aged men visit general practitioners albeit less often. Table 1 shows data from the 'Bettering the Evaluation and Care of Health' (BEACH) study published by the AIHW; it is evident that 75% of men aged 45-49, 80% of men aged 50-54 and 84% of men aged 55-59 attend their general practitioner each year.<sup>12</sup>

There are high levels of risk factors among general practice patients and most people with elevated risk factors see their general practitioner; for example, 70% of smokers see a general practitioner at least once over a 6 month period.<sup>13</sup>

*TABLE 1: Proportion of Australians who attended general practice at least once in 2000-01 by age and sex<sup>12</sup>*

	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75+
<b>Males</b>	72.0%	74.5%	75.5%	80.2%	84.3%	89.1%	90.1%	94.4%	74.6%
<b>Females</b>	86.8%	87.4%	86.9%	91.8%	92.6%	94.2%	91.2%	91.1%	93.8%

**Accuracy of self report:** The evidence suggests that people are reasonably accurate in providing information to their general practitioners. When compared with biochemical measures, most general practice patients accurately self report smoking status<sup>14</sup> and alcohol consumption.<sup>15,16</sup>

**Feasibility of widespread screening:** Theoretically it is relatively easy to access the approximately 20,200 general practitioners through Divisions of General Practice and general practitioners acknowledge that part of their clinical responsibility involves screening and intervention for risk factors.<sup>17,18</sup>

However, in practice, it has proved more difficult to implement screening and intervention programs systematically in general practice. We know that general practitioners screen well for tobacco usage, screen moderately well for obesity, and do not screen particularly well for physical inactivity levels. Even though there are now developed self report questionnaires for general practitioners to use, comprised of only two or three questions to measure physical activity, uptake by general practitioners of these to assess physical activity is relatively low. This is despite efforts by the National Heart Foundation, other non-Government organisations, general practice organisations and Colleges and researchers to encourage general practitioners to provide at least screening for these risk factors. General practice professional bodies, through frameworks described as SNAP, and SNAPO have approaches to encourage general practitioners to screen for these risk factors. This means that most smokers are recognised, and mostly given brief advice, some obesity is recognised, but few of those with sedentary lifestyle are recognised and recorded in primary care.

Participation in programs by both Divisions and general practitioners is determined by factors such as ongoing priorities, amount of funding provided by external agencies and enthusiasm and dedication of staff. The preparedness of general practitioners to engage in ongoing health promotion activities is likely to be influenced by the perceived value of the proposed activity and the economic costs imposed upon the individual general practitioner.<sup>19,20</sup>

**Intervention:** Both general practitioners and their patients perceive their primary care physicians as the preferred source of information regarding health risk

behaviours such as smoking, high-risk alcohol consumption and exercise.<sup>21,22</sup> There is robust evidence that general practitioners can be effective in encouraging changes in risk behaviours (see Question 2). However, general practitioners often do not routinely implement programs to change risks in their patients due to a myriad of factors including lack of education and training, non-standardised guidelines, low financial incentive, time constraints, patient reluctance, and competing priorities.<sup>22-25</sup>

## **Conclusion**

In summary, it seems likely that screening for risk factors in the workplace may miss many at risk individuals since only 65% of the population over 15 are in paid employment. Further, it may be difficult to mount systematic screening and intervention programs across the many Australian workplaces – particularly considering that 95% of workplaces employ less than 20 people. Some problems also exist in obtaining accurate self-report information from employees. Screening programs in the workplace will require substantial investment in pilot programs and developmental research in order to increase participation rates and assess the reliability and validity of measurement.

Primary care appears to be a more optimal setting for changing health behaviours; general practitioners see most people at risk, are more likely to receive accurate information about health behaviours, and are seen by their patients as appropriate sources of health advice. The infrastructure for a systematic approach to screening exists through the Divisions of General Practice. The major difficulty is to ensure that sufficient numbers of general practitioners take up the complex challenge of screening enough of their attending patients for these diabetes and vascular disease risk factors, given the busy constraints of their other primary care work.

## References

1. Australian Institute of Health and Welfare. *Diabetes: Australian facts 2002*. AIHW cat. no. CVD20. Canberra: AIHW; 2002.
2. Australian Bureau of Statistics. *National Health Survey: Summary of results 2004-05*. Canberra: ABS; 2006.
3. Australian Bureau of Statistics. *Labour Force Australia, September 2006*. ABS cat no. 6202.0. Canberra: ABS; 2006.
4. Australian Institute of Health and Welfare. *Australia's health 2006*. AIHW cat. no. AUS73. Canberra: AIHW; 2006.
5. Webb G, Redman S, Gibberd R, Sanson-Fisher R. The relationship between high-risk and problem drinking and the occurrence of work injuries and related absences. *Journal of Studies on Alcohol* 1994;55: 434-446.
6. Webb G, Redman S, Gibberd R, Sanson-Fisher R. The reliability and stability of a quantity frequency method and a diary method of measuring alcohol consumption. *Drug and Alcohol Dependence* 1991;27: 223-231.
7. Head J, Stansfeld S, Siegrist J. The psychosocial work environment and alcohol dependence: a prospective study. *Occupational and Environmental Medicine* 2004;61:219-224.
8. Donaldson S, Grant-Vallone E. Understanding self-report bias in organisational behaviour research. *Journal of Business and Psychology* 2002;17(2):245-260.
9. Aoun S, Johnson L. Diabetes education and screening in worksites in rural Western Australia. *Health Promotion Journal of Australia* 2002; 13(1): 65-68.
10. Commonwealth of Australia. *Encouraging Enterprise: A Report on Small Business 2005-06*. Canberra: Commonwealth of Australia; 2006. Available from: [www.industry.gov.au](http://www.industry.gov.au)
11. Peersman G, Harden A, Oliver S. *Effectiveness of health promotion interventions in the workplace: a review*. London: Health Education Authority; 1998. Available from: [www.nice.org.uk/page.aspx?o=501959](http://www.nice.org.uk/page.aspx?o=501959)
12. Bayram C, Britt H, Kelly Z, Valenti L. *Male consultation in general practice in Australia 1999-00*. AIHW cat. no. GEP11. Canberra: Australian Institute of Health and Welfare; 2003. Available from: [www.aihw.gov.au/publications/index.cfm/title/8389](http://www.aihw.gov.au/publications/index.cfm/title/8389)
13. Doran C, Pekarsky B, Gordon M, Sanson-Fisher R. General practitioners' role in preventive medicine: Scenario analysis using smoking as a case study. *Addiction* 1998;93(7):1013-1022.
14. Dickinson J, Wiggers J, Leeder S, Sanson-Fisher R. General practitioners' detection of patients smoking status. *Medical Journal of Australia* 1989;150:420-426.
15. Maitso S, Saitz R. Alcohol use disorders: Screening and diagnosis. *American Journal on Addiction* 2003;12:S12-S25.
16. Allen J, Litten R, Lee A. What you need to know: Detecting alcohol problems in general medicine practice. *Singapore Medical Journal* 1998;39(1):38-41.
17. McCormick K, Cochran N, Back A, Merrill J, Williams E, Bradley K. How primary care providers talk to patients about alcohol: A qualitative study. *Journal of General Internal Medicine* 2006;21(9):966-972.

18. Wiggers J, Sanson-Fisher R. General practitioners as agents of health risk behaviour change: opportunities for behavioural science in patient smoking cessation. *Behavior Change* 1994;11(3):167-176.
19. Pinto B, Goldstein M, & Marcus BH. Activity counselling by primary care physicians. *Preventive Medicine* 1998;27:506-513.
20. Ashenden R, Silagy C, Weller D. A systematic review of the effectiveness of promoting lifestyle change in general practice. *Family Practice* 1997;(2):160-175.
21. Schnoll R, Rukstalis M, Wileyto P, Sheilds A. Smoking cessation treatment by primary care physicians: An update and call for training. *American Journal of Preventive Medicine* 2006;31(3):233-239.
22. Williford H, Barfield B, Lazenby R, Olson M. A survey of physician's attitudes and practices related to exercise promotion. *Preventative Medicine* 1992 Sep;21(5):630-6.
23. Glasgow R, Ory M, Kleges L, Cifuentes M, Fernald D, Green L. Practical and relevant self-report measures of patient health behaviours for primary care research. *Annals of Family Medicine* 2005;3(1):73-81.
24. Bonevski B, Sanson-Fisher R, Campbell E. Primary care practitioners and health promotion: A review of current practice. *Health Promotion Journal of Australia* 1996;6(1):22-31.
25. Ward J, Gordon J, Sanson-Fisher R. Strategies to increase preventive care in general practice. *Medical Journal of Australia* 1991;154:523-531.

**B****Relative effectiveness of physical activity and nutrition interventions in the workplace.****Adrian Bauman****University of Sydney****Headline review question**

What is the evidence about the relative effectiveness of physical activity and nutrition interventions in workplaces compared to primary care, home or community settings once someone has been identified as being at-risk?

**What does the evidence say?**

This question asks whether workplace is an effective setting for changing exercise and diet compared to primary care/general practice or community settings in at-risk populations. This implies a secondary prevention approach, with screening preceding allocation to the interventions in worksites, primary care and the community.

There are substantial numbers of studies that have examined the impact of interventions to change diet and exercise in these settings. However, the quality of these studies is very variable, and relatively few took this specific 'secondary prevention' approach. Many studies are based on volunteer samples or settings; for example, motivated primary care practitioners or worksites are examined in published studies, but are not representative of those professionals or settings in general.

This summary focuses on reviews of the evidence and reviews of reviews; these are of better quality and more recent for physical activity than for diet.

Workplace

The evidence about the impact of interventions in the workplace is equivocal.

The majority of studies report interventions that have targeted individuals, although more recent studies were supported by environmental modifications of a varying degree. In a review conducted in 1998, Peersman et al.<sup>1</sup> concluded that comprehensive programs combining screening and risk assessment with a choice of education programs and/or environmental changes have been somewhat effective in selected volunteer workplace samples.

A high quality review by Dishman et al.<sup>2</sup> examined the impact of worksite programs to modify physical activity. They carried out a meta-analysis, and demonstrated that worksite programs to date had failed to show substantial effects on worksite participants' levels of physical activity, irrespective of the dose, intensity or theoretical framework of the intervention, suggesting this important risk behaviour was not amenable to influence through a worksite setting. Other summary papers reported limited potential to influence physical activity outcomes, but no evidence upon work-related outcomes.<sup>3,4</sup>

More recently, a 'review of reviews' of physical activity interventions reached the same conclusion as Dishman et al.,<sup>2</sup> and noted that findings from studies examining the effectiveness of workplace interventions in promoting changes in physical activity are inconsistent.<sup>5</sup> The paper by Hillsdon et al. is of particular importance because it was undertaken for the NHS as part of the Health Development Agency and conformed with their rigorous approach to reviews of reviews.<sup>5</sup>

All of the reviews agree that it is currently difficult to evaluate the impact of workplace interventions because of the diversity of interventions trialled. However, the most promising workplace interventions for promoting physical activity and nutrition appear to be comprehensive multi-component approaches that include education, employee and peer support for physical activity, incentives, and access to exercise facilities.<sup>6,7</sup> Similarly, the limited evidence for nutrition interventions suggest that environmental changes to workplaces may be more effective than previous individual-based approaches.<sup>8,9</sup>

### Primary care

The review of reviews by Hillsdon et al.<sup>5</sup> also examined the impact of physical activity interventions in health care settings. This paper considered eight separate reviews including 56 quasi-experimental and experimental studies. It concluded that:

- Brief advice from a health professional supported by written materials is likely to be effective in producing a modest short term (6-12 weeks) effect on physical activity
- Referral to an exercise specialist based in the community can lead to longer term changes in physical activity

A very recent systematic review by Eakin and Smith<sup>10</sup> based on work for the Australian National Institute of Clinical Studies (NICS) came to similar conclusions, reporting that general practitioner interventions for physical activity produced brief effects, with limited longer term maintenance.

Limited evidence is available for nutrition counselling in primary care, but a recent randomised trial showed promising results.<sup>11</sup> The Australian SNAP framework has

been shown to be acceptable for the context of general practice, but only process evaluation has been reported to date.<sup>12</sup>

Although there is evidence to support the impact of general practitioners in providing advice about diet and exercise, it should be noted that:

- Many of these studies, especially the physical activity promotion trials, target all general practice patients, not just those attending with identified chronic disease risk factors. While the population health goal is whole community shift in diet and physical activity, the specific question under consideration here is to address effectiveness in high risk patients specifically, and in specific high risk group targeting, general practitioner advice seems to be of similar efficacy to general patient targeted diet and physical activity advice.<sup>13</sup>
- There is considerable evidence to show that general practitioners do not routinely implement health promotion interventions even when they are demonstrated to be effective. This issue was discussed in Question 1. A major challenge is to encourage general practitioners to provide advice on a routine basis.

#### Community and home settings

A 'review of reviews' of physical activity interventions investigated the effectiveness of interventions in community settings (i.e. where participants are not recruited via a specific setting such as general practice or workplace).<sup>5</sup> Settings included home-based programs and programs conducted in structured settings such as fitness and leisure centres.

Hillsdon et al.<sup>5</sup> concluded that:

- Interventions targeting individuals in community settings are effective in producing short-term changes in physical activity, and are likely to be effective in producing mid- to long-term changes in physical activity
- Interventions based on theories of behaviour change, which teach behavioural skills and are tailored to individual needs, are associated with longer-term changes in behaviour than interventions without a theoretical base
- Interventions that promote moderate intensity physical activity, particularly walking, and are not facility dependent, are also associated with longer-term changes in behaviour
- Studies that incorporate regular contact with an exercise specialist tend to report sustained changes in physical activity

However, these conclusions are based on a small number of studies (13 trials) and a very broad range of interventions. Of these 13 studies, eight reported statistically

significant differences in physical activity between intervention and control groups. Three studies included in the review reported significant differences in physical activity between intervention and control groups at two year follow-up; all of these focused on walking and one of these studies has shown that the effect can be sustained for up to ten years. All of these studies were conducted in the US.

However, these studies were not general population studies in a usual sense; the recruitment of participants often involved extensive screening and testing and therefore is likely to have resulted in highly motivated participants, or reporting data from small samples attending programs of those initially referred to these interventions. Most involved well educated participants only and some used university staff. The staff delivering the interventions were typically part of a university research team and it is not known whether similar results could be achieved at the community level. In addition, unlike the studies in general practice, it seems likely that professionals to deliver the interventions would need to be identified as would the resources to pay for them.

## **Conclusions**

Based on current knowledge, the most effective setting for changing health behaviours like diet and exercise appears to be primary care, producing consistent short term effects. Although the impact of general practitioner interventions tends to be brief, there is some evidence that referral to an exercise specialist or other professionals, adjunctive to the general practitioner, and based in the practice or in the community, can lead to longer term changes in physical activity at least. Community-based physical activity programs show variable effects, but home based programs [self directed] seem to show at least as clear effectiveness, and possibly better behavioural maintenance than structured programs.<sup>14</sup>

In comparison, the evidence about the impact of workplace interventions is equivocal and overall studies have failed to show substantial effects on worksite participants' levels of physical activity. Although community based programs show some promise, their impact has yet to be evaluated in a way that can support conclusions about population based programs in Australia.

## References

1. Peersman G, Harden A, Oliver S. *Effectiveness of health promotion interventions in the workplace: a review*. London: Health Education Authority; 1998.
2. Dishman R, Oldenburg B, O'Neil H, et al. Worksite physical activity interventions. *American Journal of Preventive Medicine* 1998;15(4):344-61.
3. Proper KI, de Bruyne MC, Hildebrandt VH, van der Beek AJ, Meerding WJ, van Mechelen W. Costs, benefits and effectiveness of worksite physical activity counseling from the employer's perspective. *Scandinavian Journal of Work, Environment and Health* 2004;30:36-46.
4. Proper KI, Koning M, van der Beek AJ, Hildebrandt VH, Bosscher RJ, van Mechelen W. The effectiveness of worksite physical activity programs on physical activity, physical fitness, and health. *Clinical Journal of Sports Medicine* 2003;13:106-17.
5. Hillsdon M, Foster C, Cavill N, Crombie H, Naidoo B. *The effectiveness of public health interventions for increasing physical activity among adults: a review of reviews. Evidence briefing, 2nd edition*. London: Health Development Agency; 2005.
6. Katz DL, O'Connell M, Yeh MC, Nawaz H, Njike V, Anderson LM, Cory S, Dietz W; Task Force on Community Preventive Services. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. *MMWR. Recommendations and Reports* 2005;54(RR-10):1-12.
7. Matson-Koffman DM, Brownstein JN, Neiner JA, et al. A site-specific literature review of policy and environmental interventions that promote physical activity and nutrition for cardiovascular health: what works? *American Journal of Health Promotion* 2005;19(3):167-93.
8. Sorensen G, Linnan L, Hunt MK. Worksite-based research and initiatives to increase fruit and vegetable consumption. *Preventive Medicine* 2004;39 (Suppl 2):S94-S100.
9. Steenhuis I, Van Assema P, Van Breukelen G, et al. The impact of educational and environmental interventions in Dutch worksite cafeterias. *Health Promotion International* 2004;19(3):335-343.
10. Eakin EG, Smith BJ, Bauman A. Evaluating the population health impact of physical activity interventions in primary care - are we asking the right questions? *Journal of Physical Activity and Health* 2005;2:197-215.
11. Sacerdote C, Fiorini L, Rosato R, et al. Randomized controlled trial: effect of nutritional counselling in general practice. *International Journal of Epidemiology* 2006;35(2):409-415.
12. Harris MF, Hobbs C, Davies GP, et al. Implementation of a SNAP intervention in two divisions of general practice: a feasibility study. *Medical Journal of Australia* 2005;183(10):S54-S58 Suppl.
13. Marshall AL, Booth ML, Bauman AE. Promoting physical activity in Australian general practices: a randomised trial of health promotion advice versus

- hypertension management. *Patient Education and Counseling* 2005 Mar; 56:283-90.
14. Bauman A. Physical Activity and Exercise Programs. Chapter 21, pp 319-335. In Bouchard C, Blair SN, Haskell WL [Eds] *Physical Activity and Health*. Illinois: Human Kinetics Publishers; 2006.

**C****Minimum intensity of intervention to change diet or physical activity to reduce the risk of progression to diabetes.****Adrian Bauman****University of Sydney****Headline review question**

What is the minimum intensity of intervention required to change diet or physical activity sufficiently to result in a significant reduction in risk of progression to diabetes?

**What does the evidence say?**

The first issue here is based on the diabetes prevention program trial in the USA,<sup>1</sup> Finland,<sup>2</sup> China,<sup>3</sup> and India.<sup>4</sup> We can define the minimum thresholds for physical activity and for weight loss required to reduce the risk of developing diabetes in those with impaired glucose tolerance. It appears that the minimum recommendation for health, around 150 minutes of moderate intensity physical activity per week, is sufficient to reduce risk in this population.

Diet change is usually assessed in terms of weight loss. The amount of weight loss required for diabetes prevention is less clear. In the US diabetes prevention program, around 5% of total body mass seems to confer a protective effect in those that were overweight or obese, so that for a person who weighed 80 kilograms, a weight loss of around four or five kilograms would be a substantial contribution to reducing the risk of progressing to diabetes.<sup>1</sup> However in the India diabetes prevention project, Ramachandran et al. (2006) observed that physical activity and dietary changes were sufficient, even in the absence of weight loss, to prevent diabetes.<sup>4</sup> This suggested that a metabolic effect of a healthy lifestyle was independent of weight loss, and these are probably mediated through improved insulin resistance.

With respect to cardiovascular events, an important secondary/tertiary prevention trial compared physical activity programs with clinical interventions (stenting) for patients with stable angina; this randomized trial reported that six sessions of 10 minutes (one hour daily) was required to produce the intervention effect, where exercise training was better than clinical stenting on the risk of subsequent cardiac events over 12 months.<sup>5</sup> It may be that more structured exercise programs are required for secondary and tertiary prevention, in order to ensure adherence to the

dose and intensity required. More sustained exercise may be required in this tertiary prevention setting, targeting at risk patients. In addition, it appears that increased duration is also required where weight loss is expected as a direct result of physical activity.<sup>6</sup>

With respect to the dose of physical activity, it appears that around five sessions per week of at least a moderate intensity activity (accumulating half an hour per day) would be sufficient. This means physical activity needs to be regular and it is this regularity that appears to confer benefits on improved insulin resistance, rather than the infrequent activity of people who are only active once or twice a week.<sup>7,8</sup>

There is much debate on the issue of whether group versus individual sessions are more useful. By this it is assumed that group sessions are 'structured exercise programs' run in groups with an individual based counsellor or group leader; these can regulate the duration, frequency and intensity of physical activity that people participate in. The alternative, home based physical activity that individuals do on their own, is more convenient and more accessible, but the dose of physical activity is less able to be regulated. There is much evidence that motivated individuals at home can do as much physical activity as those in groups, and that this may be more sustainable in the long term.<sup>9</sup> However there is some research that suggests initial group participation does help to build the habit of physical activity amongst sedentary people at risk of diabetes, and as such may provide initial behavioural training, which might be able to be maintained subsequently at home.

In summary, it appears that group programs might be useful to initiate physical activity behaviours, but in the longer term behavioural programs to encourage physical activity targeting people in their own domestic and local environments maybe most useful in maintaining that physical activity. Short term positive effects from group programs with subsequent attrition in the behaviour of being active is unlikely to produce any long term reduction in diabetes risk, so that for long term maintenance both motivated individuals and supported environments for physical activity in their neighbourhood are important public health goals.

## References

1. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine* 2002;346(6):393-403.
2. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukkaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen V, Uusitupa M; Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine* 2001;344(18):1343-50.
3. Pan XR, Li GW, Hu YH, Wang JX, Yang WY, An ZX, Hu ZX, Lin J, Xiao JZ, Cao HB, Liu PA, Jiang XG, Jiang YY, Wang JP, Zheng H, Zhang H, Bennett PH, Howard BV. Effects of diet and exercise in preventing NIDDM in people with impaired glucose tolerance. The Da Qing IGT and Diabetes Study. *Diabetes Care* 1997;20(4):537-44.
4. Ramachandran A, Snehalatha C, Mary S, Mukesh B, Bhaskar AD, Vijay V; Indian Diabetes Prevention Programme (IDPP). The Indian Diabetes Prevention Programme shows that lifestyle modification and metformin prevent type 2 diabetes in Asian Indian subjects with impaired glucose tolerance (IDPP-1). *Diabetologia* 2006;49(2):289-97.
5. Hambrecht R, Walther C, Möbius-Winkler S, Gielen S, Linke A, Conradi K, Erbs S, Kluge R, Kendziorra K, Sabri O, Sick P, Schuler G. Percutaneous coronary angioplasty compared with exercise training in patients with stable coronary artery disease: a randomized trial. *Circulation* 2004;109:1371-8.
6. Saris WH, Blair SN, van Baak MA, Eaton SB, Davies PS, Di Pietro L, Fogelholm M, Rissanen A, Schoeller D, Swinburn B, Tremblay A, Westerterp KR, Wyatt H. How much physical activity is enough to prevent unhealthy weight gain? Outcome of the IASO 1st Stock Conference and consensus statement. *Obesity Reviews* 2003;4:101-14.
7. USSG 1996. United States Department of Health and Human Services (USDHHS). *Physical activity and health: a report of the Surgeon General*. Atlanta, GA: Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; 1996.
8. Bauman AE. Updating the evidence that physical activity is good for health: an epidemiological review 2000-2003. *Journal of Science and Medicine in Sport* 2004;7(1 Suppl):6-19.
9. Bauman A. Physical Activity and Exercise Programs. Chapter 21, pp 319-335. In Bouchard C, Blair SN, Haskell WL [Eds] *Physical Activity and Health*. Illinois: Human Kinetics Publishers; 2006.

**D****Examples of innovative programs at the local, state or international level that have been highly effective in changing diet or physical activity participation.****Adrian Bauman****University of Sydney****Headline review question**

Are there any examples of innovative programs at the local, state or international level that have been highly effective in changing diet or physical activity participation?

**What does the evidence say?**

At the population level there are only three countries that have achieved sustained increases in physical activity participation rates over the past decade or two.<sup>1,2</sup> These countries are Singapore, Finland and Canada, and an examination of the population level interventions, policy directions and cultural norms in those three countries provide useful case studies for us to understand the reasons why they maintained or increased physical activity levels at the population level.

The key features that underlie Canada and Finland successes in increasing physical activity are a cultural norm that favours outdoor activities, an active population, and self concept at the national level that is a physically active one.<sup>3,4</sup> In other developed countries we have lost this, and we require sustained efforts to re-create an 'active social norm'.

Both Canada and Finland (but particularly Canada) has had a multi-year history of sustained social marketing to promote active living. Canada's initiative was through the ParticipACTION Program and communications strategy which lasted from about 1972 until 2001, and is currently undergoing a resurrection as a national strategy.<sup>3</sup> It included major commitments to social marketing, public private partnerships, and school based programs, under a consistent thematic heading, ParticipACTION. This provided the sustained infrastructure, social norm changing messages, and inter-agency commitment to physical activity and active living throughout these decades. Similar ongoing and well resourced integrated sporting and cultural promotion has occurred in Finland for decades, so also increased their physical activity levels since 1979 when population monitoring began.<sup>1</sup> A much more regulatory approach has been introduced in Singapore, where more mandatory approaches have been tried, and the commitment to enforcement has been a population strategy that has contributed to increases in leisure time physical activity.<sup>5</sup>

## **Conclusion**

These principles of good public health practice, with sufficient investment, commitment and timeframe seem necessary to change in population level physical activity, given the cultural pressures towards increasing sedentarism, decreasing active time, especially among children.

**References**

1. Barengo NC, Nissinen A, Tuomilehto J, Pekkarinen H. Twenty-five-year trends in physical activity of 30- to 59-year-old populations in eastern Finland. *Medicine and Science in Sports and Exercise* 2002;34:1302-7.
2. Craig CL, Russell SJ, Cameron C, Bauman A. Twenty-year trends in physical activity among Canadian adults. *Canadian Journal of Public Health* 2004;95(1):59-63.
3. Bauman A, Madill J, Craig CL, Salmon A. ParticipACTION: this mouse roared, but did it get the cheese? *Canadian Journal of Public Health* 2004;95(Suppl 2):S14-9.
4. Vuori I, Lankenau B, Pratt M. Physical activity policy and program development: the experience in Finland. *Public Health Reports* 2004;119:331-45.
5. Health Promotion Board, Singapore. *National healthy lifestyle programme*. Available from: [www.hpb.gov.sg/hpb/default.asp?pg\\_id=985](http://www.hpb.gov.sg/hpb/default.asp?pg_id=985) (accessed Oct 2006).

**E****Relative cost effectiveness of risk reduction programs delivered by general practitioners or other health professionals in comparison to community educators.****Bill Bellew****Bellew Consulting****Headline review question**

What is the relative cost effectiveness of risk reduction\* programs delivered by general practitioners or other health professionals in comparison to community educators?

**What does the evidence say?**

Two recent systematic reviews have assessed (i) the relative effectiveness (but not cost effectiveness) of population health interventions in the general practice setting and (ii) the referral options for general practitioners in lifestyle interventions. Other broader systematic reviews and some single studies have reported cost effectiveness and are included here. No pertinent systematic reviews or good quality studies of community educators or other health professionals were found other than for community pharmacies. Relative cost effectiveness studies are in the early developmental stages with respect to prevention/ lifestyle interventions. The Australian ACE (Assessing Cost Effectiveness) simulation methodology and report is used to inform this headline review with regard to childhood obesity interventions; a recently commenced and broader ACE Prevention study at the University of Queensland will not report its findings for 2-3 years however.<sup>1</sup>

An Australian led review of the relative effectiveness of population health interventions in the general practice setting used a non-Cochrane but nonetheless very systematic approach and was conducted out of the University of Melbourne.<sup>2</sup> It concluded that providing general practitioners with information on referral programs may be more effective than having them conduct detailed interventions themselves; that brief advice to patients on behaviour change is favoured over longer-term counselling; and that lifestyle counselling delivered by practice nurses may be just as effective as when it is delivered by general practitioners. The Review supported the integration of Quality Assurance, educational and Evidence-Based- (EBG) or Clinical Practice Guideline (CPG) activity in a planned, multidisciplinary approach. It found that salaried and capitated services facilitate

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\* Risk reduction here refers specifically to risk behaviour modification through lifestyle interventions (including both lifestyle interventions specifically aimed at preventing the onset of type 2 diabetes and, more broadly, lifestyle interventions aimed at reducing chronic disease risk factors).

general practice led prevention activities and that with an identifiable practice population carry out more population health work. Targeted payments also appear to enhance some preventive activities. There was some evidence that fee for service systems adversely impact equity of health outcomes.

A more recent systematic review nicely complements this earlier one by focusing on lifestyle intervention referral options.<sup>3</sup> The researchers examined published studies but also unpublished programs (predominantly in Australia) dealing directly with the referral components of lifestyle advice in smoking, nutrition, alcohol, physical activity and obesity implemented in the general practice setting. This review found that:

- Brief intervention for risk factor reduction by general practitioners was effective but the reach, compliance and sustainability of this advice has yet to be translated fully into large population health outcomes;
- Studies and commentary on lifestyle risk factor management consistently noted the theoretical advantage of linking general practitioner advice to practice or community based providers who can assist patients more intensively in the desired behaviour changes. In fact, most of the guidelines available on the management of the lifestyle risk factors include referral to another provider as a critical component of any general practice intervention. However, the specific details of this 'referral' are neither well documented in the literature, nor has the concept been tested thoroughly. Not one study was uncovered that actually compared the effectiveness of a general practice intervention with or without a referral component;
- There is robust evidence for the effectiveness of brief general practice interventions in the five (SNAPO) risk factor areas; if general practitioners deliver the advice, a proportion of those targeted will adopt the positive behaviour change without further assistance. This proportion varies with the risk factor intervention and the underlying characteristics of the general practitioner as well as the patient;
- Referral and support services that act to enhance the effectiveness of general practitioner advice varied in the type, intensity, frequency and setting of contact in these studies, but do share some common elements (operational requirements for the referral model):
  - a) a clear process (including steps and tools if available) of general practitioners identifying those at risk
  - b) a central point of contact (preferably a single point of contact) and coordination to receive referrals from general practitioners
  - c) a referral database that is kept up to date and responsive to the needs of the target population
  - d) quality assurance (QA) frameworks for skills training and level of service provided at the referral destinations
  - e) appropriate skills and content knowledge in risk factor areas as well as motivational interviewing and crisis management capacity for people staffing referral destination roles.

Very few cost effectiveness studies have been published which can inform this headline review. Effects of the lifestyle intervention used in the USA Diabetes Prevention Program (DPP) on health and economic outcomes have been modelled in one recent study.<sup>4</sup>

Either using metformin or delaying the lifestyle intervention until after a person develops diabetes was modelled to be more cost-effective, costing about \$35,400 US dollars or \$24,500 dollars per QALY gained, respectively, compared with no program. Compared with delaying the lifestyle program until after diabetes is diagnosed, the marginal cost-effectiveness of beginning the DPP lifestyle program immediately would be about \$201,800 US dollars. Compared with no program, lifestyle modification for high-risk people can be made cost-saving over 30 years — provided that the annual cost of the intervention can be reduced to about \$100 dollars; it is concluded that less expensive interventions are needed to achieve the degree of weight loss seen in the DPP. Another recent economic modelling study examined incorporation of the DPP interventions into clinical practice in 5 developed countries; this was projected to lead to increased DM-free years of life, improvements in life expectancy, and either cost savings or minor increases in costs compared with standard lifestyle advice in a population with IGT. The study concluded that financial constraints should not prevent the implementation of DM prevention programs.<sup>5</sup> A similarly positive economic modelling study was recently reported by Australia's National Centre for Social and Economic Modelling (NATSEM).<sup>6</sup> The study indicates that a Type 2 Diabetes prevention program would 'pay-for-itself' through the savings in direct health care costs even taking a very conservative approach to the estimation of the potential cost-savings. The NATSEM study incorporated a costing of Aus \$7.50 per capita for the prevention program but it is very important to note that this investment figure is based on the *total* population and not on a population sub-group.

Cost effectiveness data on physical activity lifestyle prescription from New Zealand's 'Green Prescription' RCT<sup>7</sup> can be noted along with cost effectiveness data from USA's Project Active RCT.<sup>8</sup> In the NZ trial 878 'less-active' patients aged 40-79 years in 42 general practices were given verbal advice and a written exercise prescription given by general practitioners, with telephone exercise specialist follow-up compared with usual care. Significant increases in physical activity were found. Program-cost per patient was NZ\$170 dollars from a funder's perspective. The monthly cost-effectiveness ratio for total energy expenditure achieved was \$11 dollars per kcal/kg/day. The incremental cost of converting one additional 'sedentary' adult to an 'active' state over a twelve-month period was NZ\$1,756 dollars in program costs. In the USA Project Active Trial a centre-based lifestyle intervention that consisted of behavioural skills training was compared to a structured exercise intervention that included supervised, centre-based exercise. Both interventions increased physical activity. At 6 months, the costs of the lifestyle and structured interventions were, respectively, \$46.53 and \$190.24 per participant per month. At 24 months these costs were \$17.15 and \$49.31 per participant per month. At both 6 months and 24 months, the lifestyle intervention was more cost-effective than the structured intervention for most outcomes measures.

A 2003 review found 4 RCTs demonstrating the contribution of community pharmacy-based services to the reduction of risk behaviours and risk factors for CHD. The published studies provided evidence of clinical and cost-effectiveness of community pharmacy services from UK RCTs in smoking cessation, and from US and Canadian RCTs in lipid management in the prevention of heart disease.<sup>9</sup>

The Australian ACE Obesity studies use simulation-modelling techniques to generate 'ICERs' (Incremental Cost Effectiveness Ratios).<sup>10</sup> Health benefit is measured in terms of a reduction in disability adjusted life years (DALYs) due to the intervention in question. An ICER is then calculated as the incremental cost (\$) per incremental DALY saved. The results for prevention efforts in childhood obesity span general practice, Health Professional and Community based approaches and show the usefulness of adopting this common metric.

**Not cost-effective under current assumptions** (ICERs available)

- Active After-School Community Program
- Active Transport programs for Primary School Children: Walking School Bus
- Active Transport programs for Primary School Children : TravelSMART Schools

**Cost effective**

- Family-based general practice-mediated intervention targeting overweight and moderately obese children. [Net cost per DALY saved (with cost-offsets) \$24,000 (95% UI \$6,000, infinity)]
- Multi-faceted school-based intervention without active physical education. [Net cost per DALY saved (with cost-offsets) All children: \$6,000 Girls: \$13,000 Boys: \$40,000]

**Cost-effective and cost-saving**

- School-based health promotion program to reduce TV viewing. [Gross cost per DALY saved \$3,000 (\$1,500 - \$7,000)]
- Multi-faceted school-based intervention with additional active physical exercise. [Gross cost per DALY saved \$7,000 (\$5,000, \$9,000)]
- School-based focused nutrition education intervention to reduce the consumption of sweetened carbonated beverages [Gross cost per DALY saved. \$3,000]
- Family-based targeted program for obese children. [Gross cost per DALY saved \$4,000 (\$3,000; \$8,000)]
- A multi-faceted school-based intervention targeted at overweight or obese children (age of 7-10 years). [Gross cost per DALY saved \$3,000 (\$1,000, \$10,000)]
- Reduction in TV advertising of high fat and/or high sugar foods and beverages directed at children (up to the age of 14 years). [Gross cost per DALY saved \$3.70 (\$2.40; \$7.70)]

**Conclusion**

There is robust evidence for the effectiveness of brief general practice interventions in the five ('SNAPO') risk factor areas. Practice Nurses may be just as effective as general practitioners in delivering lifestyle counselling. The evidence supports a closer examination of the wider provision of smoking cessation and lipid management through community pharmacies. Brief general practitioner advice to patients on behaviour change is favoured over longer-term counselling. Providing general practitioners with information on referral programs may be more effective than having them conduct detailed interventions themselves. The evidence supports a planned, multidisciplinary approach for lifestyle interventions; more studies are needed on referral programs and this

information will be important in finding ways to drive down the costs of Diabetes Prevention interventions inspired by the efficacy shown in DPP or Finnish trials. A behaviourally-based lifestyle intervention approach (integrating moderate-intensity physical activity into daily life) is more cost-effective than a structured exercise program. For prevention of childhood obesity relative cost effectiveness estimates are now available which suggest that some school/family/community based interventions are likely to be more cost effective than general practitioner-mediated intervention; relative cost effectiveness estimates should be considered provisional, though strongly indicative of the relative magnitude of the health gain. Expected gains from the current arsenal of interventions is unlikely to be sufficient to reverse the trend towards increasing levels of overweight and obesity among children and youth.

## References

- 1 Vos T et. al. (current). *ACE-Prevention (Assessing Cost-Effectiveness Prevention)*. From <http://www.uq.edu.au/bodce/index.html?page=37712&pid=0>
- 2 Sims J, Dalton A, Dunt D, Furler J, Harris C, Harrison D, James C, McKenzie R, Naccarella L, Young D. *The Relative Effectiveness of Population Health Interventions in the General Practice Setting*. Melbourne: University of Melbourne Department of General Practice and Public Health; 2001.
- 3 Huang N, Menzies D. *Referral Options for GPs in Lifestyle Interventions: A review of the evidence*. Melbourne: Kinect Australia/AGDHAC; 2005.
- 4 Eddy DM, Schlessinger L, Kahn R. Clinical outcomes and cost-effectiveness of strategies for managing people at high risk for diabetes. *Annals of Internal Medicine* 2005;143(4):251-264.
- 5 Palmer AJ, Roze S, Valentine WJ, Spinaz GA, Shaw JE, Zimmet PZ. Intensive lifestyle changes or metformin in patients with impaired glucose tolerance: modeling the long-term health economic implications of the diabetes prevention program in Australia, France, Germany, Switzerland, and the United Kingdom. *Clinical Therapeutics* 2004;26(2):304-21.
- 6 NATSEM. *Economic Modelling of Diabetes Prevention*. Canberra: University of Canberra; 2006.
- 7 Elley R, Kerse N, Arroll B, Swinburn B, Ashton T, Robinson E. Cost-effectiveness of physical activity counselling in general practice. *New Zealand Medical Journal* 2004;117(1207):U1216.
- 8 Sevick MA, Dunn AL, Morrow MS, Marcus BH, Chen GJ, Blair SN. Cost-effectiveness of lifestyle and structured exercise interventions in sedentary adults: results of project ACTIVE. *American Journal of Preventive Medicine* 2000;19(1):1-8.
- 9 Blenkinsopp A, Anderson C, Armstrong M. Systematic review of the effectiveness of community pharmacy-based interventions to reduce risk behaviours and risk factors for coronary heart disease. *Journal of Public Health Medicine* 2003;25(2):144-153.
- 10 ACE-Obesity Working Group. *ACE-Obesity: Assessing Cost-effectiveness of Obesity Interventions in Children and Adolescents. Summary of Results*. Melbourne: Victorian Government Department of Human Services; 2006.

**F****Relative effectiveness of free versus charged-for programs in changing diet and physical exercise.****Bill Bellew****Bellew Consulting****Headline review question**

What is the evidence about the relative effectiveness of free versus charged for programs in changing diet and physical exercise?

**What does the evidence say?**

Systematic reviews provide evidence on the positive but modest effects of dietary and physical activity interventions but insufficient evidence to answer this question. This headline review therefore draws on other reviews and studies of relevant interventions to provide insights which may inform policy decisions.

A systematic review for the US Task Force on Community Preventive Services has assessed broadly the intervention of improving access to physical activity.<sup>1</sup> The review found that people will become more physically active in response to “the creation of or improved access to places for physical activity, combined with distribution of information”. Ten studies which met the criteria included environmental as well as policy interventions but were evaluated as a “combined package” because it was not possible to separate out the effects of each individual component. Median estimates from the reviewed studies suggest that creating or improving access to places for physical activity can result in a 25% increase in the percent of persons who exercise at least 3 times a week. Most of the studies also reported weight losses or decreases in body fat among program participants. On that basis, the Task Force has recommended implementing such efforts.

Systematic reviews of interventions for promoting physical activity,<sup>2</sup> providing dietary advice for beneficial changes in diet and cardiovascular risk factors,<sup>3</sup> prevention of childhood obesity<sup>4</sup>, and getting children to eat more fruit and vegetables<sup>5</sup> all show positive albeit modest outcomes but the variety of study design, quality, target population, and outcome measures in the reviews, make it impossible to draw conclusions in the way required for this headline question.

The issue of home versus centre-based physical activity programs in older adults has been assessed in a recent systematic review.<sup>6</sup> There are no longer term studies in

this population. Home based programs appear to have a significantly higher adherence rate than centre-based programs. This conclusion is based primarily on the one study showing an adherence rate of 68% in the home-based program at two year follow-up compared with 36% adherence in the centre-based group.

A systematic evaluation has been conducted of major commercial weight loss programs in the United States.<sup>7</sup> The largest trial assessed reported a loss of 3.2% of initial weight at 2 years. Programs were associated with high costs, high attrition rates, and a high probability of regaining 50% or more of lost weight in 1 to 2 years. Commercial interventions available over the Internet and organized self-help programs produced minimal weight loss. Many studies do not control for high attrition rates, so that reported results probably represent “best-case scenarios”.

A systematic review of interventions designed to increase fruit and vegetable intake concluded that interventions using telephone or computer-tailored information are a reasonable alternative to face to face counselling,<sup>8</sup> while a meta-analytic review of web-based compared to non-web interventions found positive effects on knowledge and/or behaviour change for a range of behaviours including duration of physical activity, nutritional knowledge and 18-month weight loss maintenance.<sup>9</sup>

Some individual studies are noteworthy with the caveat that findings are not always generalisable. The Norwegian School Fruit Programme evaluated paid versus no-cost approaches. Pupils attending the free fruit schools had significantly higher intake of fruit and vegetables at school than the pupils at the “Paid fruit” and “No fruit” schools ( $P < 0.001$ , mean intakes were 1.1, 0.4 and 0.2 portions, respectively). Subscribers at the “Paid fruit” schools themselves had significantly higher intake than non-subscribers at the same schools.<sup>10</sup> A recent community based trial tested the efficacy of an 8-week nutrition and physical activity intervention with a sample of 366 predominantly healthy, obese African American women.<sup>11</sup> The intervention produced modest short-term improvements in body composition. The economic incentive of a free 1-year gym membership was reportedly a more potent intervention than the education and social support intervention yet no positive effects were detected at 12 month follow up. The Central Sydney Tai Chi Trial involved paid classes.<sup>12</sup> It tested a 16-week, introductory, community-based Tai Chi program for community-dwelling older people aged 60 years or older aiming to reduce falls by 35%. The study recruited over 700 participants over a two and a half year period, making this the largest trial of its type. Classes were conducted at a variety of community venues. To increase the chances of the classes being sustained beyond the study period, the trial worked in partnership with SHARE, a non-profit organisation providing physical activity classes, and the participants paid AUD\$4 per session. The program did reduce the overall rate of falls during the study period by 35%; multiple falls (twice or more) during the study period were reduced by 70%. At July 2005, one and a half years after the end of the study, 18 out of a possible 33 classes were sustained independently with three additional Tai Chi classes commencing.

## **Conclusion**

Efforts for the creation of or improved access to places for physical activity, combined with distribution of information are recommended. Home based programs appear to be superior to centre-based programs in terms of the adherence to exercise (especially in the long-term). Providing a free piece of fruit or a vegetable may be an effective strategy to increase school children's fruit and vegetable intake. With the exception of one trial of Weight Watchers, evidence for the paid use of the major commercial and self-help weight loss programs is poor. Subsidised gym memberships may in themselves be insufficient for sustainable physical activity gains. There is good evidence that paid Tai Chi classes using existing service providers and infrastructure in a NSW setting can deliver positive and sustainable outcomes for older populations. The current evidence is insufficient to draw firm conclusions about relative effectiveness of free versus charged for programs in changing diet and physical exercise. Interim, multi-strategic portfolios rather than single or isolated approaches are recommended for population interventions to enhance physical activity and dietary behaviours.

## References

- 1 Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, Stone EJ, Rajab MW, Corso P. The effectiveness of interventions to increase physical activity. A systematic review. *American Journal of Preventive Medicine* 2002;22(4 Suppl):73-107.
- 2 Hillsdon M, Foster C, Thorogood M. Interventions for promoting physical activity [Systematic Review]. *Cochrane Database of Systematic Reviews* 2005 Jan 25;(1):CD003180.
- 3 Brunner EJ, Thorogood M, Rees K, Hewitt G. Dietary advice for reducing cardiovascular risk. *Cochrane Database of Systematic Reviews* 2005 Oct 19;(4):CD002128.
- 4 Summerbell CD, Waters E, Edmunds LD, Kelly S, Brown T, Campbell KJ. Interventions for preventing obesity in children [Systematic Review]. *Cochrane Database of Systematic Reviews* 2005 Jul 20;(3):CD001871.
- 5 Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: a systematic review. *Preventive Medicine* 2006;42(2):85-95.
- 6 Ashworth NL, Chad K, Harrison EL, Reeder BA, Marshall SC. Home versus center based physical activity programs in older adults. *Cochrane Database of Systematic Reviews* 2005;(1):CD004017.
- 7 Tsai AG, Wadden TA. Systematic review: an evaluation of major commercial weight loss programs in the United States. *Annals of Internal Medicine* 2005;142(1):56-66.
- 8 Pomerleau J, Lock K, Knai C, McKee M. Interventions designed to increase adult fruit and vegetable intake can be effective: a systematic review of the literature. *The Journal of Nutrition* 2005;135(10):2486-95.
- 9 Wantland DJ, Portillo CJ, Holzemer WL, Slaughter R, McGhee EM. The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. *Journal of Medical Internet Research* 2004;10;6(4):e40.
- 10 Bere E, Veierod MB, Klepp KI. The Norwegian School Fruit Programme: evaluating paid vs. no-cost subscriptions. *Preventive Medicine* 2005;41(2):463-70.
- 11 Yancey AK, McCarthy WJ, Harrison GG, Wong WK, Siegel JM, Leslie J. Challenges in improving fitness: results of a community-based, randomized, controlled lifestyle change intervention. *Journal of Women's Health (Larchmont)* 2006;15(4):412-29.
- 12 Rissel C, Voukelatos A, Cumming C, Lord S. *The Central Sydney Tai Chi Trial*. Online publication, October 2005.

**G****What is the evidence about the extent to which follow-up improves the effectiveness of diet and physical activity programs.****Bill Bellew****Bellew Consulting****Headline review question**

What is the evidence about the extent to which follow up improves the effectiveness of diet and physical activity programs? Follow up could involve things like telephone contact, email reminders, SMS reminders, face to face or group sessions.

**What does the evidence say?**

Specific systematic reviews on dietary and physical activity interventions provide evidence on the positive but modest effects achieved but insufficient evidence to answer this more detailed question. This headline review therefore draws on a broader range of systematic reviews as well as other relevant reviews; some individual studies of program characteristics, adherence and effectiveness are also cited in order to provide insights which may inform policy decisions.

*Systematic reviews*

A review of interventions for promoting physical activity, (11 studies; 3940 participants) was positive and moderate, with a pooled standardised mean difference of 0.31 (95% CI 0.12 to 0.50). Better results were evident when physical activity was self-directed (i.e. involved “goal-setting”) with some professional guidance and when there was on-going professional support.<sup>1</sup>

The issue of home versus centre-based physical activity programs in older adults has been assessed showing higher adherence rates for home-based programs (based on one study showing an adherence rate of 68% in the home-based program at two year follow-up compared with 36% in the centre-based group); there are no longer term studies.<sup>2</sup> For adult workplace settings, the US Task Force on Community Preventive Services has conducted systematic reviews of the evidence on nutrition, physical activity, combinations of these interventions, and other behavioural interventions (such as self-awareness and cue recognition). The resulting recommendations are for multi-component interventions that include nutrition and physical activity (including strategies such as providing nutrition education or dietary

prescription, physical activity prescription or group activity, and behavioural skills development and training) to control overweight and obesity.<sup>3</sup> The (USA – CDC) Guide to Community Preventive Services\* (*The Community Guide*) reviews find strong evidence that social support interventions in community settings are effective in increasing levels of physical activity. These interventions focus on changing physical activity behaviour through building, strengthening, and maintaining social networks that provide supportive relationships for behaviour change. Interventions typically involve setting up a “buddy” system, making a “contract” with others to achieve specified levels of physical activity, or setting up walking or other groups to provide companionship and support while being physically active. Four studies showed a median net increase in time spent on physical activity of 44.2% (inter-quartile range, 19.9% to 45.6%). Three studies showed change in frequency of exercise or physical activity with a median net increase of 19.6% (inter-quartile range, 14.6% to 57.6%). *The Community Guide* also finds strong evidence that individually adapted health behaviour change programs are effective in increasing levels of physical activity.<sup>4</sup> These programs are tailored to the individual’s readiness for change, specific interests, and preferences. Programs teach participants specific behavioural skills that enable them to incorporate moderate-intensity physical activity into daily routines. Behaviours may be planned (eg a daily scheduled walk) or unplanned (eg taking the stairs when the opportunity arises). All of the interventions evaluated were delivered to people either in group settings or by mail, telephone, or directed media. Many or most of these interventions use constructs from one or more established health behaviour change models such as the Transtheoretical Model of Change (also known as “stages of change theory”). All programs meeting review criteria incorporated the following behavioural approaches:

- (1) setting goals for physical activity and self-monitoring of progress toward goals;
- (2) building social support for new behavioural patterns;
- (3) behavioural reinforcement through self-reward and positive self talk;
- (4) structured problem-solving geared to maintenance of the behaviour change; and
- (5) prevention of relapse into sedentary behaviours.

A Review for the U.S. Preventive Services Task Force assessed counselling to promote a healthy diet in adults. It found that moderate- or high-intensity counselling interventions, including use of interactive health communication tools, can reduce consumption of saturated fat and increase intake of fruit and vegetables (interactive health communications include the use of computer-generated telephone or mail messages). Brief counselling of unselected patients by primary care providers appears to produce small changes in dietary behaviour, but its effect on health outcomes is unclear.<sup>5</sup> Reviewing the prevention of childhood obesity, the majority of studies are found to be short-term; of more promising studies two focus on physical activity alone where a multi-media approach appeared to be effective.<sup>5</sup> For interventions promoting fruit and vegetable consumption in children evidence is strongest in favour of multi-component approaches but more in-depth studies with longer follow-up periods are needed to answer the question of follow up and

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\* Guide to Community Preventive Services <http://www.thecommunityguide.org/index.html>

effectiveness.<sup>6</sup> For interventions designed to increase adult fruit and vegetable intake it is concluded that using telephone or computer-tailored information are a reasonable alternative to face to face counselling.<sup>7</sup>

A systematic review has assessed the effectiveness of weight loss and maintenance interventions in women. It examined 17 studies meeting criteria which included a minimum of one year or longer in duration. It is noteworthy that all of the interventions assessed included *at least monthly follow-up*. Data were pooled and average weight loss and maintenance for women at 6 and 12 months was determined. Diet as the primary intervention resulted in a weight loss of approximately 7 kg at 6 months (approximately 13% of their initial weight), which was maintained to 12 months. When specific goals for physical activity or weight loss medications were combined with diet, better outcomes were experienced. Regardless of the intervention, at approximately 6 months a weight loss plateau occurred.<sup>8</sup>

A meta-analytic review of web-based compared to non-web interventions found positive effects on knowledge and/or behaviour change for a range of behaviours including duration of physical activity, nutritional knowledge and 18-month weight loss maintenance.<sup>9</sup>

#### *Other evidence reviews*

A 2006 review has assessed the effectiveness of telephone-based counselling on improving dietary fat, fruit, and vegetable consumption for adults.<sup>10</sup> Telephone-based counselling promotes significantly greater improvements in fruit/vegetable consumption (median effect size=0.41) and dietary fat intake (median effect size=0.22) relative to usual care. It is not yet known how advantageous telephone-based counselling is over traditional forms of dietary counselling. At present, telephone-based counselling may best be used as a complement to clinical care and a means to broaden the outreach of nutrition services. A 2004 review specifically assessed *goal setting* more specifically as a strategy for dietary and physical activity behaviour change.<sup>11</sup> Thirteen of the 23 adult studies used a goal-setting effectiveness study design; eight produced positive results supporting goal setting of which four intervention evaluation studies showed positive outcomes. A 2005 synthesis of interventions designed to modify physical activity and dietary behaviours (at the same time) found that overall, to varying degrees and for those completing the programs, the interventions were effective for increasing physical activity, lowering dietary fat, weight loss, and reducing risk for illness. The studies were however characterised by problems with adherence to the interventions and retention in the programs.<sup>12</sup> In 2005 two reviews of exercise-referral schemes were conducted in the UK. One review found increased physical activity levels in individuals who are not sedentary but already slightly active, older adults and those who are overweight (but not obese). The review concluded that increases may not be sustained over time and that further studies are required to find strategies to increase long-term adherence.<sup>13</sup> The other review included a 12-month tracking study of a cohort of exercise referral participants (n = 342), which measured leisure-time physical activity levels at

baseline (entry to exercise referral) and at 3 monthly intervals thereafter. Adherence to the ERS was approximately 35-45%, with the older participants more likely to complete. This review concluded that exercise referral benefits certain segments of the population, but not necessarily all and that participants referred by cardiac and practice nurses had higher levels of adherence than participants referred by general practitioners.<sup>14</sup> A 2005 review of interventions for adolescent weight loss study mainly commented on study dropout rates (as high as 45%), and the lack of conceptual frameworks guiding the studies.<sup>15</sup> A 2004 review focussed on physical activity interventions for the treatment of overweight and obesity and type 2 diabetes among adults.<sup>16</sup> It found that strategies that combine diet and PA are more effective than PA strategies alone. Combined lifestyle strategies are most successful for maintained weight loss, although most programs are unsuccessful in producing long-term changes. There was little evidence about compliance to prescribed behaviour changes or the factors that promote or hinder compliance to lifestyle changes. Limited evidence suggested that continued professional contact and self-help groups can help sustain weight loss.

#### *Relevant individual studies*

- An RCT in the USA assessed 6 months of a weekly group intervention (“health at every size” program vs “diet” program), followed by 6 months of monthly aftercare group support.<sup>17</sup> Attrition (6 months) was high in the “diet” group (41%) compared with 8% in the “health at every size” group. 50% of both groups returned for 2-year evaluation. “Health at every size” participants maintained weight, improved in all outcome variables, and sustained improvements. “Diet” group participants lost weight and showed initial improvement in many variables at 1 year but this weight was regained and little improvement was sustained at the 2 year point.
- A US 12-month RCT assessed a weight-loss intervention auspiced by an HMO.<sup>18</sup> It used a) a workbook alone, b) the addition of computerized tailoring using onsite computer kiosks with touch screen monitors, and c) the addition of both computers and staff consultation. It found that computers can facilitate selecting behavioural change goals. More frequent usage resulted in greater weight loss. Staff counselling to augment the computer intervention achieved the most weight loss.
- Recent studies suggest that stage-based ‘expert systems’ have potential for interventions addressing physical activity and dietary behaviours. These interventions provide individualized feedback that guides participants through the stages of change for each of their risk behaviours.<sup>19,20</sup>
- A NSW-based RCT investigated a program delivered by mail or by a combination of mail-outs and interactive group sessions.<sup>21</sup> Diets, physical fitness, and blood cholesterol improved up to 12 months after beginning the 4-month program, mainly in the interactive group.
- Despite a strong case for the potential of telephone and internet delivered physical activity interventions, an Australian-led 2003 review found “as yet little evidence that they can be effective”; all were thought likely to be important elements of future public health interventions.<sup>22</sup>

- A US study of female 8th graders found that self-management strategies (goal-setting) mediated the association of self-efficacy with physical activity.<sup>23</sup>
- An Australian RCT testing a physical activity print-based intervention, and a print- plus telephone-mediated intervention among mid-life and older Australian adults found that the print-plus-telephone group maintained slightly higher levels of activity and walking (by approximately 30 mins/wk) than those in the print group.<sup>24</sup>
- New Zealand RCTs of a successful General Practice based physical activity intervention involved general practitioners giving oral and written advice during usual consultations while exercise specialists continued support by telephone and post over a three-month period.<sup>25,26</sup>
- The successful USA (primary care based) multi-site Activity Counselling Trial (874 initially sedentary primary care patients, ages 35-75 years, at risk for CVD) has shown how specific patient subgroups (e.g., obese, unfit individuals; high-income individuals in stable health) may respond differently to varying levels and amounts of professional assistance and support.<sup>27</sup>
- A Finnish 10-year follow-up of middle-aged and elderly men and women found that physical activity interventions may need to emphasize the amount, intensity, and type of weekly LTPA, rather than weekly energy expenditure.<sup>28</sup>
- US studies undertaken to compare strategies for the adoption and maintenance of moderate-intensity, home-based physical activity found that brief baseline instruction followed by continuing telephone contact with staff can be used to help people into “adoption” and that this can be maintained by simple self-monitoring strategies (daily monitoring being better than weekly).<sup>29</sup>
- The first year of the Active for Life effectiveness trial (community-based 6-month, telephone-based or 20-week, group-based program) has shown some success in community settings with diverse populations.<sup>30</sup>
- Several studies involving the use of pedometers<sup>31</sup> have shown promise and a very recent Canadian study has reported favourably on linking these devices with a mass media campaign.<sup>32</sup>

## Conclusions

Programs to promote physical activity are more effective when they involve “goal-setting” with some professional guidance and have some on-going professional support. Home-based programs have shown better results than centre-based programs in adherence rates. There is evidence that brief initial instruction followed by continuing telephone contact with staff can be used to help people into “adoption” and that this can be maintained by simple self-monitoring strategies (daily monitoring being better than weekly).

Social support interventions in community settings are effective; the focus is on building, strengthening, and maintaining social networks that provide supportive relationships for behaviour change. Interventions typically involve setting up a “buddy” system, making a “contract” with others to achieve specified levels of physical activity, or setting up walking or other groups to provide companionship and support while being physically active.

Individualised programs tailored to a person's readiness for change, specific interests, and preferences can be effective. Participants need to be taught specific behavioural skills that enable them to incorporate moderate-intensity physical activity into daily routines. Interventions may be delivered to people in group settings or by mail, telephone, or directed media. Many of these interventions use the Stages of Change or similar models of behaviour change.

Programs have now been deployed using 'expert systems' to intervene on physical activity and dietary behaviours; the interventions provide individualized feedback that guides participants through the "stages of change" for each of their risk behaviours. "Expert systems" warrant further investigation because they have the potential to reach large populations very efficiently and to provide complementary, follow-up or alternatives to more human resource intensive interventions. Whether 'expert system' or more low-tech, programs should include:

1. setting goals for physical activity and self-monitoring of progress toward goals;
2. building social support for new behavioural patterns;
3. behavioural reinforcement through self-reward and positive self talk;
4. structured problem-solving geared to maintenance of the behaviour change; and
5. prevention of relapse into sedentary behaviours.

Programs addressing adult overweight and obesity should use multi-component interventions that include nutrition and physical activity; they should include strategies such as provision of nutrition education or dietary prescription, physical activity prescription or group activity, as well as behavioural skills development and training.

Adherence to exercise referral schemes in the UK have been reported as 35-45% ; benefits appear more likely for those already slightly active (but not sedentary), older adults and those who are overweight (but not obese). People referred by practice nurses had higher levels of adherence than participants referred by general practitioners.

Web-based interventions can have positive effects on knowledge and/or behaviour change for a range of behaviours including duration of physical activity, nutritional knowledge and 18-month weight loss maintenance. Targeted consumer groups are more likely to access the web site as a result of off-line promotional activities and 'standalone' websites are not effective compared to those linked with a comprehensive range of supporting strategies.

Interventions involving the use of pedometers have shown promise and a Canadian mass media campaign has used them effectively; their use is consistent with evidence on the importance of goal setting and self-monitoring to improve adherence.

## References

1. Hillsdon M, Foster C, Thorogood M. Interventions for promoting physical activity [Systematic Review]. *Cochrane Database of Systematic Reviews* 2005;(1): CD003180.
2. Ashworth NL, Chad K, Harrison EL, Reeder BA, Marshall SC. Home versus center based physical activity programs in older adults. *Cochrane Database of Systematic Reviews*; 2005(1):CD004017.
3. Katz DL, O'Connell M, Yeh MC, Nawaz H, Njike V, Anderson LM, Cory S, Dietz W; Task Force on Community Preventive Services. Public health strategies for preventing and controlling overweight and obesity in school and worksite settings: a report on recommendations of the Task Force on Community Preventive Services. *Morbidity & Mortality Weekly Report Recommendations and Reports* 2005;54(RR-10):1-12.
4. Kahn EB, Ramsey LT, Brownson RC, Heath GW, Howze EH, Powell KE, Stone EJ, Rajab MW, Corso P. The effectiveness of interventions to increase physical activity. A systematic review. *American Journal of Preventive Medicine* 2002;22(4 Suppl):73-107.
5. Pignone MP, Ammerman A, Fernandez L, Orleans CT, Pender N, Woolf S, Lohr KN, Sutton S. Counseling to promote a healthy diet in adults: a summary of the evidence for the U.S. Preventive Services Task Force. *American Journal of Preventive Medicine* 2003;24(1):75-92.
6. Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: a systematic review. *Preventive Medicine* 2006;42(2):85-95.
7. Pomerleau J, Lock K, Knai C, McKee M. Interventions designed to increase adult fruit and vegetable intake can be effective: a systematic review of the literature. *Journal of Nutrition* 2005;135(10):2486-95.
8. Franz MJ. Effectiveness of weight loss and maintenance interventions in women. *Current Diabetes Reports* 2004;4(5):387-93.
9. Wantland DJ, Portillo CJ, Holzemer WL, Slaughter R, McGhee EM. The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. *Journal of Medical Internet Research* 2004;6(4):e40.
10. Vanwormer JJ, Boucher JL, Pronk NP. Telephone-based counseling improves dietary fat, fruit, and vegetable consumption: a best-evidence synthesis. *Journal of the American Dietetic Association* 2006;106(9):1434-44.
11. Shilts MK, Horowitz M, Townsend MS. Goal setting as a strategy for dietary and physical activity behavior change: a review of the literature. *American Journal of Health Promotion* 2004;19(2):81-93.
12. Blue CL, Black DR. Synthesis of intervention research to modify physical activity and dietary behaviors. *Research and Theory for Nursing Practice* 2005;19(1):25-61.
13. Morgan O. Approaches to increase physical activity: reviewing the evidence for exercise-referral schemes. *Public Health* 2005;119(5):361-70.
14. Dugdill L, Graham RC, McNair F. Exercise referral: the public health panacea for physical activity promotion? A critical perspective of exercise referral

- schemes; their development and evaluation. *Ergonomics* 2005;48(11-14):1411-22.
15. Stuart WP, Broome ME, Smith BA, Weaver M. An integrative review of interventions for adolescent weight loss. *Journal of School Nursing* 2005;21(2):77-85.
  16. Miller YD, Dunstan DW. The effectiveness of physical activity interventions for the treatment of overweight and obesity and type 2 diabetes. *Journal of Science & Medicine in Sport* 2004;7(1 Suppl):52-9.
  17. Bacon L, Stern JS, Van Loan MD, Keim NL. Size acceptance and intuitive eating improve health for obese, female chronic dieters. *Journal of the American Dietetic Association* 2005;105(6):929-36.
  18. Wylie-Rosett J, Swencionsis C., Ginsberg M, Cimino C, Wassertheil-Smoller S, Caban A, Segal-Isaacson CJ, Martin T, Lewis J. Computerized weight loss intervention optimizes staff time: the clinical and cost results of a controlled clinical trial conducted in a managed care setting. *Journal of the American Dietetic Association* 2001;101(10):1155-62.
  19. Johnson SS, Driskell MM, Johnson JL, Dymont SJ, Prochaska JO, Prochaska JM, Bourne L. Transtheoretical model intervention for adherence to lipid-lowering drugs. *Disease Management* 2006;9(2):102-14.
  20. Prochaska JO, Velicer W, Redding C, Rossi JS, Goldstein M, DePue J, Greene GW, Rossi SR, Sun X, Fava JL, Laforge R, Rakowski W, Plummer BA. Stage-based expert systems to guide a population of primary care patients to quit smoking, eat healthier, prevent skin cancer, and receive regular mammograms. *Preventive Medicine* 2005;41(2):406-16.
  21. Dzator JA, Hendrie D, Burke V, Gianguilio N, Gillam HF, Beilin LJ, Houghton S. A randomized trial of interactive group sessions achieved greater improvements in nutrition and physical activity at a tiny increase in cost. *Journal of Clinical Epidemiology* 2004;57(6):610-9.
  22. Marshall AL, Owen N, Bauman AE. Mediated approaches for influencing physical activity: update of the evidence on mass media, print, telephone and website delivery of interventions. *Journal of Science and Medicine in Sport* 2004;7(1 Suppl):74-80.
  23. Dishman RK, Motl RW, Sallis JF, Dunn AL, Birnbaum AS, Welk GJ, Bedimo-Rung AL, Voorhees CC, Jobe JB. Self-management strategies mediate self-efficacy and physical activity. *American Journal of Preventive Medicine* 2005;29(1):10-8.
  24. Ball K, Salmon J, Leslie E, Owen N, King AC. Piloting the feasibility and effectiveness of print- and telephone-mediated interventions for promoting the adoption of physical activity in Australian adults. *Journal of Science and Medicine in Sport* 2005;8(2):134-42.
  25. Elley CR, Kerse N, Arroll B, Robinson E. Effectiveness of counselling patients on physical activity in general practice: cluster randomised controlled trial. *BMJ* 2003;326(7393):793.
  26. Kerse N, Elley CR, Robinson E, Arroll B. Is physical activity counseling effective for older people? A cluster randomized, controlled trial in primary care. *Journal of the American Geriatrics Society* 2005;53(11):1951-6.

27. King AC, Marcus B, Ahn D, Dunn AL, Rejeski WJ, Sallis JF, Coday M; Activity Counseling Trial Research Group. Identifying subgroups that succeed or fail with three levels of physical activity intervention: the Activity Counseling Trial. *Health Psychology* 2006;25(3):336-47.
28. Malmberg J, Miilunpalo S, Pasanen M, Vuori I, Oja P. Characteristics of leisure time physical activity associated with risk of decline in perceived health--a 10-year follow-up of middle-aged and elderly men and women. *Journal of Preventive Medicine* 2005;41(1):141-50.
29. King AC, Taylor CB, Haskell WL, Debusk RF. Strategies for increasing early adherence to and long-term maintenance of home-based exercise training in healthy middle-aged men and women. *American Journal of Cardiology* 1988;61(8):628-32.
30. Wilcox, S., M. Dowda, Griffin SF, Rheaume C, Ory MG, Leviton L, King AC, Dunn A, Buchner DM, Bazzarre T, Estabrooks PA, Campbell-Voytal K, Bartlett-Prescott J, Dowdy D, Castro CM, Carpenter RA, Dzewaltowski DA, Mockenhaupt R. Results of the first year of active for life: translation of 2 evidence-based physical activity programs for older adults into community settings. *American Journal of Public Health* 2006;96 (7):1201-9.
31. Chan CB, Ryan DA, Tudor-Locke C. Health benefits of a pedometer-based physical activity intervention in sedentary workers." *Journal of Preventive Medicine* 2004;39(6):1215-22.
32. Craig CL, Tudor-Locke C, Bauman A. Twelve-month effects of Canada on the Move: a population-wide campaign to promote pedometer use and walking. *Health Education Research* 2006; [Epub ahead of print].

**H****Effective diabetes prevention programs that target: Indigenous people; CALD communities; and women with gestational diabetes.****Sandra Eades, The Sax Institute****Adrian Bauman, The University of Sydney****Headline review question**

Is there any evidence of effective diabetes prevention programs that target Indigenous people?

**What does the evidence say?**

The current focus of the Australian health care system is on treatment of people with existing diabetes rather than prevention of diabetes among those Aboriginal people at risk. There have been no studies designed specifically to evaluate the impact of programs to prevent diabetes among Australian Aboriginal and Torres Strait Islander people.

However, among Aboriginal people in remote communities, there have been several community based studies which aimed to reduce cardiovascular disease risk by applied nutritional and health promotion interventions and with outcomes reported after longitudinal follow up<sup>1-4</sup>. For example, a study in central Australia involved a two-year nutrition and healthy lifestyle program which focused on raising awareness of diabetes in the community, promoting healthy food buying habits and improving the quality of food purchased through the community store<sup>1</sup>. At eight year follow up the odds ratios for cardiovascular disease risk factors relative to baseline were increased for obesity, 1.84 (95% CI: 1.28-2.66), and diabetes 1.83 (95% CI: 1.11-3.03). However the risk of hypercholesterolaemia fell with an odds ratio of 0.29 (95% CI: 0.20-0.42), and dyslipidaemia increased (high triglyceride plus low HDL cholesterol level) 4.54 (95% CI: 2.84-7.29). In younger women there was a trebling in obesity prevalence and a four to five fold increase in diabetes prevalence. Store turnover data suggested a relative reduction in the consumption of refined carbohydrates and saturated fats.

A separate study in another remote community evaluated the effectiveness of a community directed intervention program to reduce coronary heart disease risk through dietary modification<sup>3</sup>. Intervention strategies included store management policy changes, health promotion activities and nutrition education aimed at high risk

individuals. Dietary advice was focused on decreasing saturated fat and sugar intake and increasing fruit and vegetable intake. Evaluation of the program involved conducting sequential cross sectional risk factor surveys at two year intervals; measuring fasting cholesterol, lipid soluble antioxidants, and homocysteine concentrations and assessing smoking status. There was a significant reduction in the prevalence of hypercholesterolaemia (age adjusted prevalences were 31%, 21% and 15% at baseline, 2 years and 4 years respectively;  $P < 0.001$ ). There were significant increases in plasma concentrations of  $\alpha$ -tocopherol, lutein and zeaxanthin, cryptoxanthin, and  $\beta$ -carotene across the population. Mean plasma homocysteine concentrations decreased by  $3\mu\text{mol/L}$ . These changes were all consistent with increased intakes of fruit and vegetables. The increase of homocysteine by  $3\mu\text{mol/L}$  was a major positive change when compared to outcomes of dietary interventions elsewhere. These changes were all consistent with increased intakes of fruit and vegetables. The increase of homocysteine by  $3\mu\text{mol/L}$  was a major positive change when compared to outcomes of dietary interventions elsewhere.

## References

1. McDermott R, Rowley KG, Lee AJ, Knight S, O'Dea K. Increase in prevalence of obesity and diabetes and decrease in plasma cholesterol in a central Australian Aboriginal community. *Medical Journal of Australia* 2000;172:480-484.
2. Rowley KG, Qing S, Cincotta M, Skinner M, Skinner K, Pindan B, White GA, O'Dea K. Improvements in circulating cholesterol, antioxidants, and homocysteine after dietary intervention in an Australian Aboriginal community. *American Journal of Clinical Nutrition* 2001;74: 442-448.
3. Rowley KG, Lee AJ, Yarmirr D, O'Dea K. Homocysteine concentrations lowered following dietary intervention in an Aboriginal community. *Asia Pacific Journal of Clinical Nutrition* 2003;12(1):92-95.
4. Lee AJ, Bonson APV, Yarmirr D, O'Dea K, Mathews JD. Sustainability of a successful health and nutrition program in a remote Aboriginal community. *The Medical Journal of Australia* 1995;162:632-635.

## Headline review question

Is there any evidence of effective diabetes prevention programs that target culturally and linguistically diverse (CALD) communities?

## What does the evidence say?

Australian *National Evidence Based Guidelines for the Management of Type 2 Diabetes Mellitus* state that there is good evidence that dietary and exercise programs using a culturally specific empowerment model comprising diabetes awareness sessions, exercise groups and cooking demonstrations can be successful in preventing type 2 diabetes onset when targeted at a high-risk population.<sup>1</sup> Evidence in support of this statement comes largely from a prospective study that assessed the impact of a two-year pilot diabetes risk reduction program in a high risk population of Western Samoans living in Auckland, New Zealand.<sup>2</sup> This study compared two church congregations of similar socioeconomic status led by the same pastor: a control congregation (n=115) and an intervention congregation (n= 67). The culturally specific intervention followed an empowerment model and consisted of diabetes awareness sessions, exercise groups and cooking demonstrations. At two year follow-up, body weight had remained stable ( $0 \pm 4.8$  kg) at the intervention church but had increased by  $3.1 \pm 9.8$  kg at the control church ( $p=0.05$ ). In the intervention church there was an associated increase in the proportion exercising regularly (+22% versus -8% in the control group,  $p < 0.05$ ) and consumption of key fatty foods was also significantly reduced (eg the proportion cutting the fat off meat had increased,  $p < 0.001$ ).

A recent literature review attempted to identify national and local documented and evaluated examples of physical activity initiatives with CALD target groups, and enablers and barriers to engaging people of CALD backgrounds in physical activity programs. Due to a lack of documented and evaluated projects, the search was broadened to research with CALD communities regarding physical activity. The review<sup>3</sup> suggests that:

- Community and service provider partnerships are critical to the long-term sustainability of physical activity programs in CALD communities<sup>4,6</sup>
- Transferring programs that work well for English-speaking communities, with little regard for underlying ethnic and cultural considerations, is problematic and often results in unsuccessful program delivery.<sup>6</sup> A variety of non-mainstream activities need to be on offer to entice a non-mainstream population.<sup>7</sup> Physical activity projects tailored for specific CALD groups have show evidence of success in objective health measures<sup>8,9</sup> but crucial to this success was the existence of adequate planning and partnership approaches by service providers<sup>5,6</sup>
- The lack of marketing strategies designed to encourage CALD communities to participate in physical activities is a significant contributing factor to the lack of

awareness about available physical activities amongst CALD consumers, and hence participation rates.<sup>10</sup> Another communication tool that appears to increase the motivation of CALD communities to undertake exercise is having the physical activity recommended by a health professional, particularly doctors, or encouraged by leaders or workers from their own community<sup>11</sup>

- Bilingual facilitators or group leaders are strongly identified in the literature as an important factor in CALD community participation in physical activity programs<sup>9</sup>
- Relationship building is a critical factor in working successfully and in a sustainable way with CALD communities<sup>6,11</sup>

In 2005 the Australian Centre for Diabetes Strategies published an overview of current diabetes projects being undertaken to address the special needs of CALD community groups across Australia by diabetes specialist services, Divisions of General Practice (DGP), Diabetes Australia and State and Territory Health Departments (Australian Centre for Diabetes Strategies, 2005). Most of the projects identified were developed to address the needs of people known to have diabetes; there were no lifestyle intervention programs identified targeting people at risk of developing type 2 diabetes.

As part of the Victorian Department of Human Services Diabetes Prevention - 'Go for your Life' Program, two pilot sites will include a focus on the needs of CALD population groups. The Inner East Primary Care Partnership will pilot the program with Chinese participants and the South East Primary Care Partnership (Dandenong) will target Sri Lankan participants.

Another potentially relevant study in progress is 'A peer-led self-management diabetes prevention program for Turkish and Arabic speaking communities', being conducted in Melbourne. The aim of this study is to develop and evaluate a culturally appropriate intervention to prevent type 2 diabetes in the Turkish and Arabic speaking communities (<http://www.phcris.org.au/elib/render.php?params=2446>).

*Note: The Centre for Chronic Disease Prevention and Health Advancement, NSW Department of Health, has recently commissioned a review of the best available evidence on the prevention of type 2 diabetes in culturally and linguistically diverse (CALD) communities. The review (which will be submitted in mid-November 2006) will identify:*

- *Evidence for interventions that are likely to be effective in reducing type 2 diabetes risk factors in CALD groups, and*
- *Evidence for interventions that have been trialled in CALD groups and shown to be effective in reducing other chronic disease risk factors.*

## References

1. Australian Centre for Diabetes Strategies. *National Evidence Based Guidelines for the Management of Type 2 Diabetes Mellitus. Part 2: Primary Prevention of Type 2 Diabetes*. Sydney; National Health and Medical Research Council: 2001.
2. Simmons D, Fleming C, Voyle J, Fou F, Feo S, Gatland B. A pilot urban church-based programme to reduce risk factors for diabetes among Western Samoans in New Zealand. *Diabetes Medicine* 1998;15:136-42.
3. Centre for Culture Ethnicity and Health. *Engaging culturally and linguistically diverse communities in physical activity: a discussion paper*. Melbourne; Centre for Culture Ethnicity & Health: 2006. Available from: [www.ceh.org.au/docs/Resources/Engaging%20CALD%20Communities%20in%20Physical%20Activity%20-%20A%20Discussion%20Paper.pdf](http://www.ceh.org.au/docs/Resources/Engaging%20CALD%20Communities%20in%20Physical%20Activity%20-%20A%20Discussion%20Paper.pdf)
4. Stickney B, Vilshankaya O. Engaging older people with English as a second language and frail older people in physical activity. *Health Promotion Journal of Australia* 2005;16(2):116-23.
5. WestBay Alliance. *Women's only health project: Maribyrnong health promotion project*. 2002.
6. Womensport and Recreation Victoria. *City of Melbourne get active program, Term 2*. 2005.
7. Vescio JA, Taylor T, Toohey K. An exploration of sports participation by girls from non-English speaking backgrounds. *The ACHPER Healthy Lifestyles Journal* 1999;46(2/3):14-19.
8. Brown WJ, Lee C, Oyomopito R. Effectiveness of a bilingual heart health program for Greek-Australian women. *Health Promotion International* 1996;11(2):117-125.
9. Brown WJ, Lee C, Nasstasia YN. Heart health for migrant women: a short intervention with Macedonian-Australian women. *Health Promotion Journal of Australia* 1997;7(2):134-137.
10. Bayly L. *Inclusive practices for culturally and linguistically diverse groups, Coaching Conference Western Australia* 2001. Available from: [www.dsr.wa.gov.au/publications/programs/conference/Inclusive%20practices%20for%20Cultural%20groups.pdf](http://www.dsr.wa.gov.au/publications/programs/conference/Inclusive%20practices%20for%20Cultural%20groups.pdf)
11. Lewis MV et al. Cultural barriers to exercise amongst the ethnic elderly. *Internet Journal of Health Promotion* 1997. Available from: [www.rhpeo.org/ijhp-articles/1997/4/index.htm](http://www.rhpeo.org/ijhp-articles/1997/4/index.htm)
12. Australian Centre for Diabetes Strategies. *A National Profile of Diabetes Projects for Culturally and Linguistically Diverse Community Groups*. Sydney; Australian Centre for Diabetes Strategies: 2005. Available from: [www.diabetesaustralia.com.au/lib/doc/pdf/cccp/ACDS-CALD-Report-050923.pdf](http://www.diabetesaustralia.com.au/lib/doc/pdf/cccp/ACDS-CALD-Report-050923.pdf)

## Headline review question

Is there any evidence of effective diabetes prevention programs that target women at risk of gestational diabetes?

## What does the evidence say?

Gestational diabetes mellitus (GDM) affects about 4% of mothers during pregnancy in NSW, with rates gradually increasing over the past decade. Similar or slightly lower rates [3-4%] are noted for all pregnancies across Australia. Rates are twice as high among mothers from East and South Asian backgrounds.<sup>1</sup>

There are several public health threats posed by GDM, including maternal and child adverse outcomes (especially, macrosomia, “large for date babies”). For these mothers, there is an increased risk of developing type 2 diabetes mellitus (T2DM), with up to a third developing T2DM within a decade of their pregnancy. Women with GDM therefore contribute a sizeable proportion of all T2DM incidence, and hence provide a good opportunity for prevention.

There is good evidence that physical inactivity and obesity are independent risk factors for the development of GDM. Women who are physically active in the year before their pregnancy show substantially reduced risk of developing GDM.<sup>2-4</sup> There is some dose response relationship with brisk walking more protective than moderate/light walking, and a threshold of 4-7 hours per week of at least moderate activity (demonstrated in Zhang et al., 2006,<sup>4</sup> although Dempsey et al., 2004,<sup>2</sup> report a lower threshold for GDM risk reduction). The effects of physical activity in reducing GDM risk appear strongest for obese women (BMI >30) than for women with lower BMI levels. Among the obesity-related indicators, waist circumference appears particularly important in GDM risk, and in the subsequent risk of developing T2DM.<sup>5</sup>

GDM is accurately captured, and on an almost complete population basis, as almost all women attend antenatal care and are screened. Hence current health services completely identify this entire ‘population-at-risk’. This provides the potential for services to link mothers with GDM to lifestyle interventions, during and especially following the pregnancy in order to reduce the risks of developing T2DM in this population group.

Diabetes prevention trials in middle aged to older adults were carried out in the USA,<sup>6</sup> Finland<sup>7</sup> and India;<sup>8</sup> these identified at-risk adults and carried out healthy lifestyle interventions to reduce diabetes (T2DM) incidence. Effects of these trials indicate substantially greater benefits of healthy lifestyle interventions even compared to pharmacological prevention.<sup>6</sup> In addition, the healthy lifestyle component is usually physical activity, prudent diet and weight loss, and these changes are achievable by intensive lifestyle intervention.<sup>6</sup> In the Indian DPP, Ramachandran et al. (2006)<sup>7</sup> showed these effects to be observed independent of weight loss, suggesting the

importance of diet and especially, of physical activity in reducing the risk of developing T2DM in mothers who have had GDM.

The application of these diabetes prevention principles to the population of women with GDM is at a very early stage of development. Women with GDM have many barriers (post-partum) to healthy lifestyle changes.<sup>9</sup> They are mostly sedentary, and report low confidence for exercise and low social support<sup>10</sup> and sub-optimal diet.<sup>11</sup> The few pilot interventions in this area have yet to demonstrate behaviour change sufficient to prevent diabetes.<sup>12</sup>

## **Conclusion**

This area of work (healthy lifestyle interventions with GDM women, post partum) remains an area of population-level intervention that could yield large health benefits and savings in health care costs. For this reason, it is an important for research and development, and then for dissemination of proven strategies to reach this population-at-risk.

**References**

1. NSW Midwives Data Collection. *Health of mothers and babies in NSW, 2003 and 2004*. NSW Health Department.
2. Dempsey JC, Butler CL, Sorensen TK, Lee IM, Thompson ML, Miller RS, Frederick IO, Williams MA. A case-control study of maternal recreational physical activity and risk of gestational diabetes mellitus. *Diabetes Research and Clinical Practice* 2004;66(2):203-15.
3. Dempsey JC, Butler CL, Williams MA. No need for a pregnant pause: physical activity may reduce the occurrence of gestational diabetes mellitus and preeclampsia. *Exercise and Sport Sciences Reviews* 2005;33(3):141-9.
4. Zhang C, Solomon CG, Manson JE, Hu FB. A prospective study of pregravid physical activity and sedentary behaviors in relation to the risk for gestational diabetes mellitus. *Archives of Internal Medicine* 2006;166(5):543-8.
5. Cho NH, Jang HC, Park HK, Cho YW. Waist circumference is the key risk factor for diabetes in Korean women with history of gestational diabetes. *Diabetes Research and Clinical Practice* 2006;71(2):177-83.
6. Knowler WC, Barrett-Connor E, Fowler SE, Hamman RF, Lachin JM, Walker EA, Nathan DM; Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *New England Journal of Medicine* 2002;346(6):393-403.
7. Tuomilehto J, Lindstrom J, Eriksson JG, Valle TT, Hamalainen H, Ilanne-Parikka P, Keinanen-Kiukkaanniemi S, Laakso M, Louheranta A, Rastas M, Salminen V, Uusitupa M; Finnish Diabetes Prevention Study Group. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine* 2001;344(18):1343-50.
8. Ramachandran A, Snehalatha C, Mary S, Mukesh B, Bhaskar AD, Vijay V; Indian Diabetes Prevention Programme (IDPP). The Indian Diabetes Prevention Programme shows that lifestyle modification and metformin prevent type 2 diabetes in Asian Indian subjects with impaired glucose tolerance (IDPP-1). *Diabetologia* 2006;49(2):289-97.
9. Downs DS, Ulbrecht JS. Understanding exercise beliefs and behaviors in women with gestational diabetes mellitus. *Diabetes Care* 2006;29:236-240.
10. Smith BJ, Cheung NW, Bauman AE, Zehle K, McLean M. Postpartum physical activity and related psychosocial factors among women with recent gestational diabetes mellitus. *Diabetes Care* 2005;28(11):2650-4.
11. Smith BJ, Cheung NW, Bauman AE, Zehle K, McLean M. Healthy diet and nutrition in a population sample of women with recent gestational diabetes mellitus. Under review 2006.
12. Stage E, Ronneby H, Damm P. Lifestyle change after gestational diabetes. *Diabetes Research and Clinical Practice* 2004;63(1):67-72.