

BE ACTIVE EAT WELL:

THREE-YEAR FOLLOW-UP REPORT



Prepared by the Be Active Eat Well Follow-Up Evaluation Team, comprising

WHO Collaborating Centre for Obesity Prevention, Deakin University
Deakin Health Economics, Deakin University

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Executive Summary

Be Active Eat Well (BAEW) was a 3-year (2003-2006) community-wide childhood obesity prevention demonstration program in Colac which successfully reduced unhealthy weight gain in children aged 4-12 years compared to the rest of the Barwon-South Western Region (the Region) of Victoria. The purpose of this report is to provide feedback to stakeholders in the Region on the findings of a follow-up assessment conducted in 2009 which asked the following questions:

1. **Investments:** Was the original BAEW program in Colac cost-effective and affordable?
2. **Community capacity:** What was the level of capacity (network partnerships, knowledge transfer, problem solving, and infrastructure) within communities in Colac and the Region to promote healthy body weight in children?
3. **Childhood overweight and obesity:** What have been the changes in childhood overweight and obesity and its related behaviours, environments and health promotion activities in Colac and the Region between 2003 and 2009?

Background: What did the initial BAEW intervention (2003-2006) achieve?

- The evaluation of the BAEW intervention in Colac (2003-2006) demonstrated positive outcomes of: increased community capacity for promoting healthy weight in children; improved food and physical activity environments; and significantly reduced weight and waist gain in primary school children compared to the rest of the Region.
- The impacts were greater in children from more disadvantaged households.
- The BAEW intervention did not increase underweight or dieting practices, or reduce children's self esteem.

Background: The 2009 follow up study

The BAEW project funding finished in 2006, although, throughout Victoria, a number of other healthy eating and physical activity promotion programs were available to communities, including 'Kids, Go For Your Life'. In 2009, a research team from Deakin University and The University of Melbourne conducted a follow-up evaluation in Colac and the Region to answer the questions outlined above. This report outlines key results from the follow-up evaluation.

Investment: Was the original BAEW intervention cost effective and affordable?

- For every dollar invested in BAEW by the Department of Health, the Colac community invested a further \$2.80 in time and money.
- The BAEW program was cost-effective in terms of reducing overweight and obesity outcomes using standard benchmarks for cost-effectiveness (ie it cost less than \$50,000 per disability-adjusted life year saved).
- Maintenance of benefit is a key assumption in cost-effective analyses. Modelling indicates that, to remain within the cost effective range, around 70% of the program's effect in terms of lower body weight would need to be maintained by those participants into adulthood.

Community capacity: What were the levels of community capacity to promote healthy body weight in children in Colac and the Region?

- Community capacity grew substantially in Colac during BAEW (2003-2006) and this remained high in 2009, despite there being no additional external resources for the program from the Department of Health after 2006.
- At three-year follow-up in 2009, the Region had similar levels of community capacity as Colac had in the BAEW and follow-up phases.
- In 2009, participants in Colac and the Region recognised the value of partnerships and drawing on local skills and knowledge in order to build and sustain community capacity.

Childhood overweight and obesity: What were the changes in childhood overweight and obesity and its related behaviours, environments, and health promotion activities in Colac and the Region?

- The proportion of children who were classified as overweight or obese (WHO criteria) decreased between 2003 and 2009 in Colac (39% to 33%) and the Region (40% to 29%) to give an overall decline of 8%-points with no statistically significant difference between Colac and the Region.
- In 2009, some behaviours had improved (eg higher fruit and water and lower fruit juice consumption; more playing outside) but the use of electronic games and the consumption of energy-dense snacks like chips increased. The behavioural changes either showed no difference between Colac and the Region or showed that the patterns had become healthier in the Region.
- These findings were supported by an analysis of children's lunchboxes which showed that fruit had increased, drinks bottles were more likely to have water than fruit juice or cordial but that

the amount of non-core (or 'junk') foods in lunch boxes had remained high for both Colac and the Region.

- Surveys of school canteens showed several areas that needed improvement with no schools in either Colac or the Region fully meeting the 'traffic light' nutrition guidelines.
- Regional audits of health promotion programs in 2002 and 2009 showed a marked increase in activity over that time period with 23 different local, state, or federal programs for healthy eating and/or physical activity being implemented for primary school-aged children in the whole of the Region in 2009.
- The resource investment (time and money) in activities to promote healthy eating and physical activity per school was much higher in Colac during the BAEW program (2003-2006) compared to the Region, however, by 2009, the Region had increased its investment substantially to being greater than that in Colac.

Summary

The 2003-2006 BAEW program in Colac was a safe, equitable, effective and cost-effective program for preventing unhealthy weight gain in children. By 2009, the number of programs promoting healthy eating and physical activity being implemented in the Region had increased substantially, compared to Colac. Many of the initial benefits from the BAEW program in Colac, such as strong community capacity, had been maintained, but not further improved, following the end of the program funding. By 2009, the Region appeared to have 'caught up' to (and in some areas overtaken) Colac in relation to community capacity, healthy environments, healthy eating and physical activity patterns, and healthy body weight. However, there were still several areas needing ongoing improvements, especially the high amount of non-core food in school lunchboxes and school canteens failing to meet the state-wide 'traffic light' nutrition guidelines.

One unexpected and very positive finding was the large decrease in the prevalence of overweight and obesity across Colac and the Region alike. This decrease of about eight percentage points over six years is substantial and very encouraging. It is in the same direction but of greater magnitude than the declines seen in overweight and obesity in the under five's population across Victoria. This highlights the need for ongoing monitoring programs to ensure that this is occurring state-wide and is closing the gaps between more and less advantaged communities.

Overall, these are positive and intriguing findings which raise the possibility that the BAEW demonstration project in Colac led the way and that some regional 'spill over' effect may have

occurred and that this, plus wider state and national activities, has helped to stimulate action more widely within communities across the region. In addition, it is possible that programs and activities are more sustainable if they grow 'organically' rather than grow quickly (and potentially stop quickly at the end of the project) in response to the flow of external project funding.

However, there is still some distance to go to achieve healthy environments and healthy behaviours and several strategies are recommended to further advance these child health gains including: stronger school food policies and policy implementation support; greater coordination and evaluation efforts across the burgeoning number of nutrition and physical activity programs; implementation of a regular monitoring system for childhood obesity, and; increased funding for comprehensive, systems-oriented community action to prevent childhood obesity.



Background

Be Active Eat Well (BAEW) was a community-wide childhood obesity prevention demonstration program which aimed to promote healthy eating and physical activity behaviours and reduce unhealthy weight gain in children aged 4-12 years in the Victorian rural town of Colac. The program was conducted 2003-2006 in Colac, a township within the Barwon-South Western Region of Victoria. Resources included funding from the Department of Human Services (now Department of Health) in addition to local organisation and other program resources. From 2006-2009, no further external programmatic funding was provided by the Department of Health for BAEW. These phases are shown in Figure 1. In 2009, a research team from Deakin University and The University of Melbourne, conducted a mixed methods evaluation to examine a number of questions relating to its ongoing effectiveness and sustainability.

Activity	2002	2003	2004	2005	2006	2007	2008	2009
BAEW intervention Planning and Design								
BAEW intervention Implementation								
Three-year Follow-up Phase (no external funding was received)								
Measurements: Anthropometry and behaviours								
Measurements: Community Capacity in Colac								
Measurements: Community Capacity in the Region								
Economic Evaluation (retrospectively for 2002-2006)								

Figure 1: BAEW implementation and follow up evaluation timelines

Important questions remained about the impact of the BAEW intervention after its completion and this report aims to answer:

1. **Investments:** Was the original BAEW program cost-effective and affordable?
2. **Community capacity:** What was the level of capacity (network partnerships, knowledge transfer, problem solving, and infrastructure) within communities in Colac and the Region to promote healthy body weight in children?
3. **Childhood overweight and obesity:** What have been the changes in childhood overweight and obesity and its related behaviours, environments and health promotion activities in Colac and the Region between 2003 and 2009?

It is important to note that the level of socio-economic disadvantage is higher in Colac than the rest of the Region and this may have an important bearing on the changes in health behaviours over time. The SEIFA index is a measure of relative socio-economic advantage/disadvantage and in 2009, 76% of Colac residents lived within postcodes in the lowest two deciles of SEIFA (compared with 3% in the Region) and 24% lived in deciles 3-6 (compared with 73% in the Region). While these differences are technically difficult to adjust for in the analyses, they do need to be taken into account in the interpretation of the findings in this report.

This report briefly reviews the impact of the original BAEW program and then reports i) the results of a cost-effectiveness evaluation of the BAEW intervention (conducted retrospectively), and ii) presents the findings from the three-year follow-up phase in Colac and the Region, specifically in relation to community capacity, children's food and activity-related behaviours and the prevalence of childhood overweight and obesity.

Be Active Eat Well Intervention Phase (2003-2006)

The BAEW intervention

Key findings of the impact of the BAEW intervention

- Compared to a representative sample from across the Region, the BAEW intervention in Colac (2003-2006): increased community capacity for promoting healthy weight; improved food and physical activity environments; and significantly reduced weight gain in primary school children.
- The impacts were greater in children from more disadvantaged households.
- The BAEW intervention did not increase underweight or dieting practices, or reduce children's self esteem.

What was the Be Active Eat Well Intervention?

The development and implementation of the BAEW intervention program was funded predominantly by the Victorian Department of Health and was the first community-based childhood obesity prevention demonstration project in Australia. BAEW aimed to promote healthy eating and physical activity behaviours and reduce unhealthy weight gain in children aged 4-12 years in the Victorian rural township of Colac. A multi-setting, multi-strategy approach was adopted which used community capacity-building principles. The intervention was to increase the community's capacity through increasing network partnerships, knowledge transfer, problem solving, and infrastructure support so that the community could develop and implement programs to prevent unhealthy weight gain in children [9].¹ The specifics of the program were developed, planned and implemented in collaboration with key organisations in Colac, in particular Colac Area Health, Colac Otway Shire, and Colac Neighbourhood Renewal. The design and planning occurred in 2002 and the implementation of the intervention program began in 2003. The details of the planning and implementation are included in publications in the Appendix [7, 8, 9, 18, 19, 25]. For further information on BAEW visit the CO-OPS Collaboration Website:

(http://www.co-ops.net.au/Pages/Public/Resource_Library.aspx)

¹ Numbers in square brackets refer to the reference list at the end of the document

The intervention was developed around ten program objectives, implemented from 2003-2006.

- **Objective 1:** To build Colac community capacity to promote physical activity and healthy eating
- **Objective 2:** To achieve a high awareness of the BAEW messages among parents and children
- **Objective 3:** To evaluate the process, impacts and outcomes of the BAEW project
- **Objective 4:** To significantly decrease the time spent watching and playing on computers or electronic games
- **Objective 5:** To significantly decrease the consumption of high sugar drinks and to promote the consumption of water
- **Objective 6:** To significantly decrease the consumption of energy dense snacks and significantly increase consumption of fruit
- **Objective 7:** To significantly increase the proportion of primary school children living within 1.5km who walk/cycle to and from school
- **Objective 8:** To significantly increase the amount of active play after school and on weekends
- **Objective 9:** (a) To investigate the potential for improving the quality (fat content and type of fat) of deep-fried chips, (b) To improve the quality of deep-fried takeaway chips
- **Objective 10:** (a) To provide a service to improve the food and physical activity choices for children who are at risk of overweight, (b) To pilot a healthy lifestyle program for parents and carers of children aged 2-12 years, focusing on healthy eating, physical activity and parenting skills.

What did the Be Active Eat Well intervention achieve?

An overview of the evaluation

The impact of the BAEW intervention was assessed through a comprehensive evaluation that ran alongside the intervention implementation. The evaluation was mixed methods and multi-level, trying to capture the broad range of potential changes that could occur. To assess the impact of the intervention on the overarching aim of promoting healthy weight and reducing childhood obesity, height, weight and waist circumference were measured in 1,001 children aged 4-12 years in the Colac intervention area (recruited through six primary schools and four preschools in Colac, response rate: 58%) and 833 children in the Region (a representative sample of the Region, recruited through six primary schools and four preschools, response rate: 44%) in 2003-2004. These same

children in both sites were followed up in 2006-2007, and 84% of the original participants were measured.

In addition to the anthropometric data, children's eating and activity-related behaviours and information about the home environment were collected using computer-assisted telephone interviews (CATI) with parents, self-completed questionnaire with students in grades 5 and 6, and lunch box surveys. On a broader level, the school environment was assessed and community capacity, using both quantitative and qualitative methods. Details of the survey instruments are available in the Appendix [20-24].

The impact of the intervention

BAEW resulted in significant improvements at all levels of the intervention [6]:

- Significant increase in the Colac community's capacity to provide a cohesive and sustained approach to obesity prevention and to implement health promotion programs.
- Improvements in some, but not all, of the behaviours targeted through the intervention (such as increased consumption of fruit and water and decreased consumption of sweet drinks at school).
- Improvements in the food environment in intervention schools. Most schools instituted some policies and practices to promote healthy eating and physical activity.
- Lower increases in the children's weight (by about 1kg) and waist measurements (by about 3cm) over three years compared to the Region. Body mass index score also reduced significantly, although the change in overweight/obesity prevalence was not statistically significant.

Importantly, the BAEW intervention seemed to have a greater effect in children from more disadvantaged homes (assessed using a variety of socio-economic indicators) and did not increase underweight or dieting practices, or reduce children's self esteem [6].

Was the BAEW intervention cost effective and affordable?

Key Findings of the cost-effectiveness analyses

- The BAEW program offered the capacity to generate substantial spin-off in terms of community activity around physical activity and healthy eating over and above funding levels. For every dollar invested in BAEW by the Department of Health, the Colac community invested a further \$2.80 in time and money.
- The BAEW program was cost-effective in terms of obesity outcomes using standard benchmarks for cost-effectiveness.
- Modelling indicated that around 70% of the benefit would need to be maintained into adulthood for the intervention to remain within the cost-effective range.

An economic evaluation was conducted retrospectively to assess the cost-effectiveness and affordability of the BAEW program during its funded phase. It aimed to determine if the 'capacity boosting' approach taken by BAEW represented a good investment for governments and communities endeavouring to prevent or reduce childhood obesity. An economic evaluation involves the incremental analysis of both the costs and outcomes of the intervention against those of the comparison. Costs include direct costs (such as paid staff time, equipment use) as well as indirect costs (such as volunteer time, donated goods, free venue hire). An economic evaluation differs from a financial evaluation, with the latter measuring only items that have actually been paid for through a financial transaction. An economic evaluation includes a cost for all goods and services used, irrespective of whether they were bought (for example, volunteer time).

Table 1 shows the average annual cost of the BAEW intervention by program objective. The average annual cost of the intervention per school community was estimated as \$61,200 over and above the cost of current practice in the Region. If the cost of evaluating this large demonstration project was included, the annual incremental cost would rise to around \$89,000 per school community (the evaluation cost \$1.14M over three years across both intervention and control communities).

Table 1: Annual average incremental costs per school community by program objective (\$)

Gross Incremental Costs by program objective	Average incremental one year costs ^{a,b}	
	\$	% of total
Objective 1: Capacity building	\$12,349	20.2%
Objective 2: Awareness raising	\$6,458	10.6%
Objective 4: Decrease television viewing	\$275	0.1%
Objective 5: Decrease soft drink, increase water consumption	\$643	1.1%
Objective 6: Increase fruit and vegetable consumption	\$2,395	3.9%
Objective 7: Increase active transport to and from school	\$3,669	6.0%
Objective 8: Increase active play after school and at weekend	\$25,801	42.2%
Objective 9: Improve quality of deep-fried takeaway chips ^c	\$2,523	4.1%
Objective 10: Pilot program for parents of overweight children ^c	\$7,091	11.6%
Total (excluding evaluation)	\$61,204	100.0%
Objective 3: Evaluation	\$19,789	
Total (including evaluation)	\$89,091	

^a Incremental costs = costs of BAEW intervention minus costs of current practice in the Region

^b Costs are exclusive of evaluation, which is specified separately in Objective 3

^c Objectives implemented across the community but costs divided by the number of schools

It was found that for every \$1 of project funding invested in the BAEW program, an additional \$2.80 worth of activity was generated at the community level.

The BAEW program was shown to be cost-effective as an obesity prevention intervention, resulting in net costs of \$29,798 per disability-adjusted life-year saved. Modelling indicates that to remain under the commonly used Australian benchmark for cost-effectiveness of \$50,000 per disability-adjusted life year saved), around 70% of the program’s effect in terms of lower body weight would need to be maintained by participants into adulthood.

In terms of affordability, the BAEW intervention compared favourably with interventions assessed as part of the previous ACE-Obesity study [26]. When modelled, the BAEW intervention cost \$344 per child which fell within the range (\$0.54-\$2,908) of the eight interventions for preventing childhood obesity (excluding treatment programs) evaluated as part of the ACE-Obesity study [26].

Three-year Follow-Up Phase (2006-2009)

What was the level of community capacity in Colac and the Region to promote healthy body weight in children?

Key Findings

- In the three-year follow-up phase from 2006-2009, there were no external resources for the BAEW program from the Department of Health, yet the community sustained its increased capacity to promote healthy eating and physical activity.
- At three-year follow-up, 2009, the Region had a similar level of community capacity as Colac in the intervention phase and were investing about twice the time and money into promoting healthy eating and physical activity in primary schools compared to Colac.
- In 2009, participants in Colac and the Region recognised the value of partnerships and drawing on local skills in order to build and sustain community capacity.

Community Capacity at Three-year Follow-up

BAEW aimed to build Colac's capacity to develop and sustain obesity-prevention initiatives, as well as reduce unhealthy weight gain in children. The initial increases in the Colac community's capacity to promote healthy eating and physical activity in primary school children which occurred during BAEW, were examined to see if they were sustained three years later in 2009.

To assess the community's capacity, school staff, and people involved in education, health and sport and recreation in both Colac and the Region (n=44) attended focus groups at follow-up in 2009 and completed a Community Capacity Index (CCI) survey [9, 20, 27]. The Colac data were compared for baseline in 2003 (n=8), post-intervention in 2006 (n=9) and follow-up in 2009 (n=17). They were also compared to the follow-up data in 2009 from the Region (n=27). There were no data collected from the Region in 2003 and 2006.

The CCI measured four domains of capacity and then ranked capacity using a score of 1-4. A score of three or more indicated that substantial capacity had been reached. The four domains of capacity were:

- **Network Partnerships:** relationships between groups and organisations within a network, for example how well do partners in the network know each other and their goals
- **Knowledge Transfer:** the development, exchange and use of information between groups, for example, how information is shared and used amongst each other
- **Problem Solving:** the ability to use well-recognised and novel methods to identify and solve problems, for example, do members of the network work together to solve problems
- **Infrastructure:** includes four areas of capacity (financial investment; human/intellectual capacity; policy investment; and social investment)
 - **Financial investment:** for example, funding initiatives such as acquiring sponsorship or fund-raising activities
 - **Human/intellectual investments:** for example, activities to ensure the development and maintenance of knowledge such as training programs
 - **Social investments:** for example, activities to build trust and relationships such as allocating time for to attend meetings
 - **Social capital:** for example, trust, norms and attitude development between people

Changes in Community Capacity in Colac following BAEW

Results showed that in Colac between baseline (2003) and immediately post-intervention (2006), there were substantial increases in the community's capacity to deliver health promotion activities around healthy eating and physical activity. At three-year follow-up in 2009, scores for each aggregate level remained relatively high, although there was a possible slight decrease in capacity for network partnerships and problem solving. Importantly, the infrastructure domain, which is designed specifically to measure sustainability, remained level with the high scores at the 2006 post-intervention (see Figure 2). A possible reason for sustaining community capacity to deliver programs was expressed by a community health worker:

“Many of the partnerships and relationships formed throughout BAEW have continued and those organisations are still working together now on projects and delivering programs within different target groups”

Participants in Colac suggested the following reasons why capacity had been sustained:

- They recognised that there was a real sense of trust in the Colac region, enabling knowledge to be freely transferred between and within organisations and networks.
- Knowledge existed in the community around best practice for program planning and that this knowledge was used and transferred into current practice to achieve positive project outcomes.
- The commitment and passion within schools. Staff, students and members of the community were seen as key elements to successful problem solving.
- They recognised the importance of partnerships and working together in the implementation of programs.
- It was believed that collaboration was important when writing policies in order for policies to be owned by the network. As one school staff member commented:

“we’ve written a policy in conjunction with our school board and our parents and friends, in terms of our ‘sometimes food policy’, which came from the... Kids Go For Your Life [Program].... we were able to actually write very clear guidelines which our parents were involved in and I think that’s why it’s been so well supported because our parents actually wrote it” (Kid’s Go For Your Life was a state-wide program which was available after the BAEW program completed)

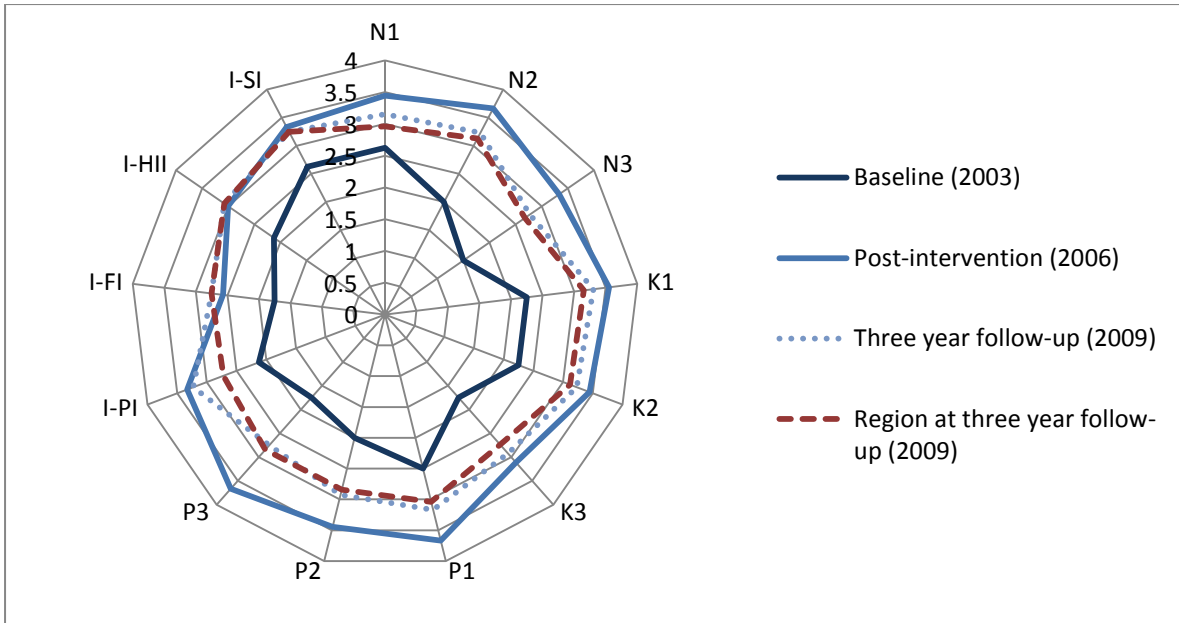


Figure 2: Change in Community Capacity in Colac 2003-2009

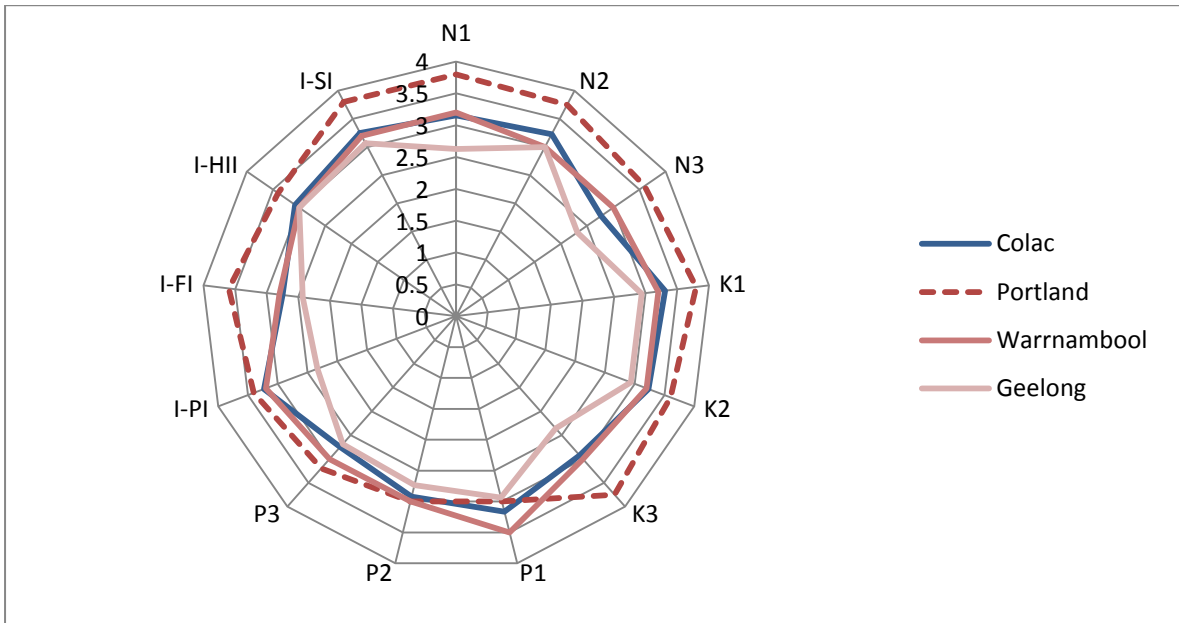


Figure 3: Community Capacity in Colac and the Region at three-year follow-up, 2009

Abbreviations: N (Network Partnership), K (Knowledge Transfer), P (Problem Solving), I (Infrastructure), PI (Policy Investment), FI (Financial Investment), HII (Human/Intellectual Investment), SI (Social Investment).

Interpretation: Each radiating line on the spidergram represents one dimension of the Community Capacity Index. Three of the dimensions (N, K, and P) have 3 levels (1, 2, 3) and the Infrastructure dimension (I) has 4 components. Scores ≥ 3 indicate substantial capacity has been achieved.

Community capacity in Colac and the Region in 2009

While community capacity was substantial in Colac in 2009, capacity in the three comparison areas in the Region was also substantial (see Figure 3). Some explanations that participants in the Region gave for community capacity being high were:

- Networks rarely worked in isolation. They had partnerships and links to other networks which means ideas and knowledge spread across boundaries.

"We have a good understanding of key players in the community, who can bring what resources to the network and help us achieve desired outcomes" (recreational community worker, in the Region)

- Partnerships and networks were seen to add value to projects by creating opportunities to transfer ideas and information, inspire each other and build capacity within the community.
- They believed that strong partnerships through the coordination of regular meetings were the key to developing networks.

"...You are attending all these meetings that are actually worthwhile in terms of networking. And the same people are at the same meetings and then there's other people and then they'll hear about it and then they'll take it to the next meeting. And so we've found that worthwhile" (community health worker, in the Region)

- There was collaboration between parents, staff and community members to write policies creating a sense of ownership among members of the network. Innovative approaches were used to attract funding.
- There was recognition and use of skills in the community to source funding, including applying for grants. Many participants also noted that approaching local businesses for sponsorship and support for programs was an innovative way to seek funding.

"actually I think that's probably one of the biggest things... that community gardens at most of the schools were built by the back links [local volunteer program] or the action grants. I don't know of one school that didn't use it" (community health worker, in the Region)

- Participants in Colac and the Region recognised the value of partnerships and drawing on local skills in order to build and sustain community capacity.

What have been the changes in childhood overweight and obesity and its related behaviours, environments and health promotion activities in Colac and the Region?

Key Findings

- The proportion of children who were classified as overweight or obese decreased over the whole region between 2003 and 2009 from 39% to 31% with no difference observed between Colac (39% to 33%) and the Region (40% to 29%).
- Children's eating and physical activity patterns showed some areas of improvement (eg higher fruit and water consumption and lower fruit juice consumption and more time playing outside) but playing electronic games and consumption of high fat snacks such as chips increased over the six years. The changes in behavioural patterns were either no different between Colac and the Region or the patterns in the Region had become healthier over time.
- At three year follow-up, children's lunchboxes were more likely to contain fruit, but servings of non-core (or 'junk') food in the lunch boxes remained high (73% had more than 1 serve). Drink bottles were more likely to contain water in both Colac and the Region.
- Surveys of school canteens showed several areas that needed improvement with no schools in either Colac or the Region fully meeting the state's 'traffic light' nutrition guidelines.
- Audits in 2002 and 2009 showed a marked increase in health promotion activity over that time period with 23 different local, state, or federal programs for healthy eating and/or physical activity being implemented for primary school-aged children in the Region in 2009.
- In 2009, schools in the Region were spending twice as much on average on health promotion activities compared to the Colac schools.

This component of the follow-up evaluation involved measuring children's anthropometry, dietary and physical activity related behaviours and perceptions, the content of children's school lunches, the school environment, community activities and health promotion costs in schools. For the follow-up evaluation, the same children who participated in the evaluation of the intervention period (2003-2006) were not able to be revisited, so instead we measured a new group of children attending the schools that were previously involved in either Colac or the Region. Response rates for the 2009 survey were 47% for Colac and 37% for the Region.

Overweight and obesity prevalence

In 2009, analyses showed that children in Colac (n=660) were not significantly different from the children in the Region (n=621) for any of the obesity-related measures tested (weight, body mass index and waist circumference). The prevalence of overweight/obesity decreased dramatically from 2003 to 2009 both Colac and the Region (39% to 31%) with no statistically significant differences between Colac (39% to 33%) and the Region (40% to 29%) (Figure 4). Note that these prevalence figures are based on the recent WHO criteria for overweight and obesity [28] which give higher values than the previously used International Obesity Taskforce (IOTF) criteria [6].

This reduction in prevalence of eight percentage-points over six years is very large when one considers that the national increase in prevalence over the 23 years of the rise in the childhood obesity epidemic was 13 percentage-points (from 10.2% in 1985 to 23.7% in 2008 for boys, and from 11.6% to 24.3% for girls [29], using IOTF criteria [30]).

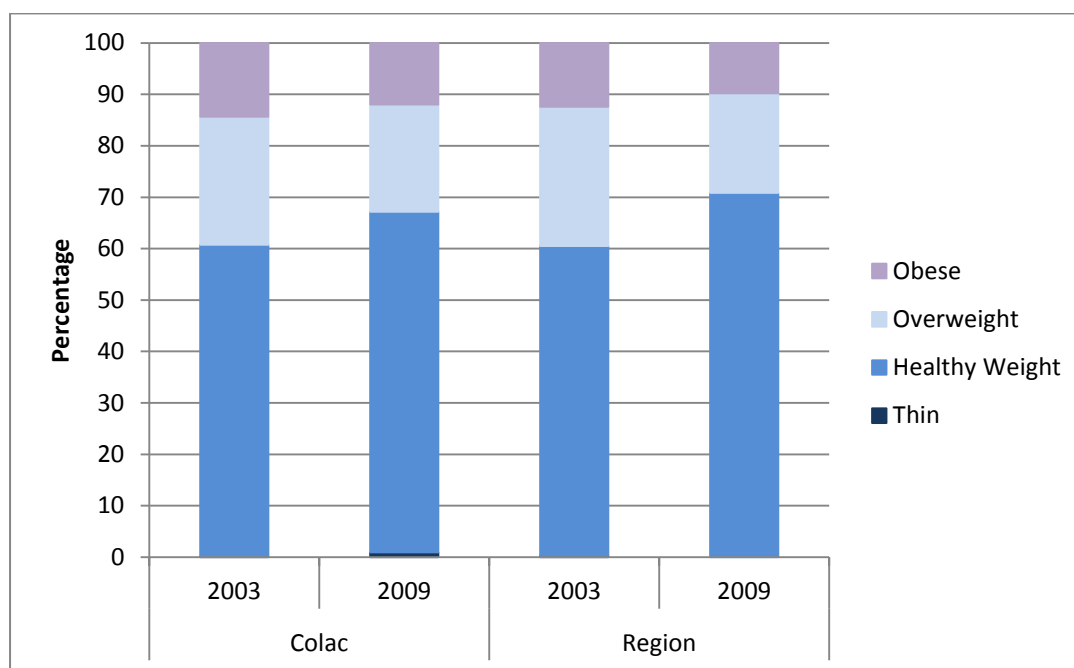


Figure 4: Children’s weight status using WHO criteria in 2003 (baseline) and 2009 (3 years post-intervention; follow-up) in the intervention area in Colac and the Region

Grades 5 & 6 student self-reported behaviours and perceptions

In 2009, Grades 5 and 6 students (Colac n=153; Region n=153) completed a questionnaire asking about food and beverage intake, sedentary behaviours, physical activity, active transport and body satisfaction. We report on key changes in 2009 for each group compared to 2003, as well as differences between Colac and the Region.

Dietary Patterns

- Consumption of two or more serves of fruit on the previous day increased in both groups with no differences between the changes in Colac (42% to 54%) compared to the Region (50% to 64%) (Figure 5).
- The proportion of children who consumed NO packaged snacks (such as potato chips, muesli bars, roll-ups, twisties and cheezels) 'yesterday' fell markedly in both groups between 2003 and 2009. In Colac, the proportion fell from 41% to 15% and this was similar to the Region which fell from 55% to 19% (Figure 6).
- The proportion of children who consumed NO sugar-sweetened soft drink 'yesterday' was high and the slight decrease in the Colac children (71% to 66%) was statistically different to the slight increase in the children in the Region (61% to 77%) (Figure 7).
- The consumption of fruit juice/cordial drinks was higher than soft drinks, but it improved between 2003 and 2009. The proportion of children who consumed NO fruit juice/cordial drinks 'yesterday' increased in Colac (20% to 31%) but increased even more in the Region (21% to 51%) (Figure 8).
- Over 90% of children ate breakfast, however, the slight drop in Colac from 2003 to 2009 (96% to 89%) was statistically significantly different to the slight increase in the Region (95% to 97%).

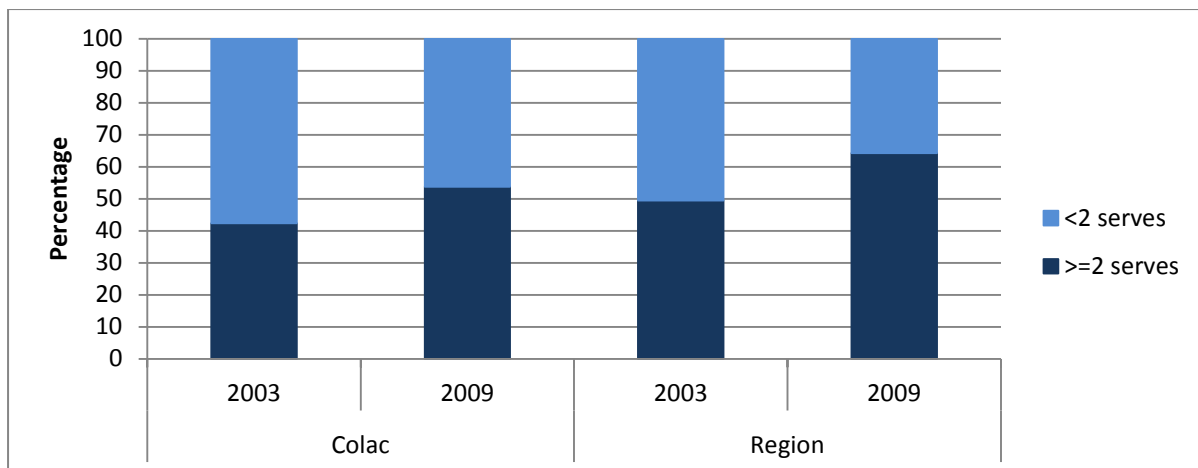


Figure 5: Grade 5 & 6 students self reported intake of fruit 'yesterday'

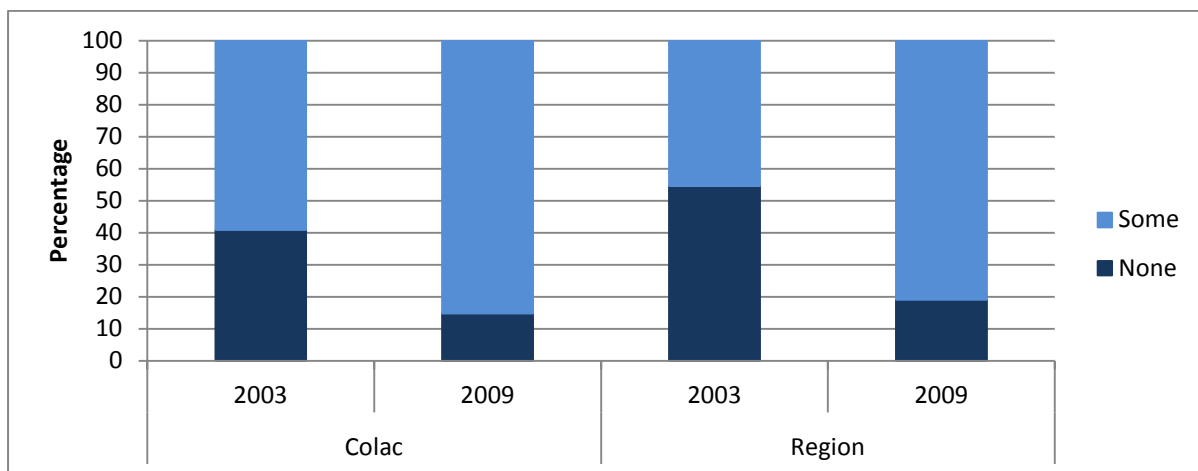


Figure 6: Grade 5 & 6 students self reported intake of packaged snacks 'yesterday'

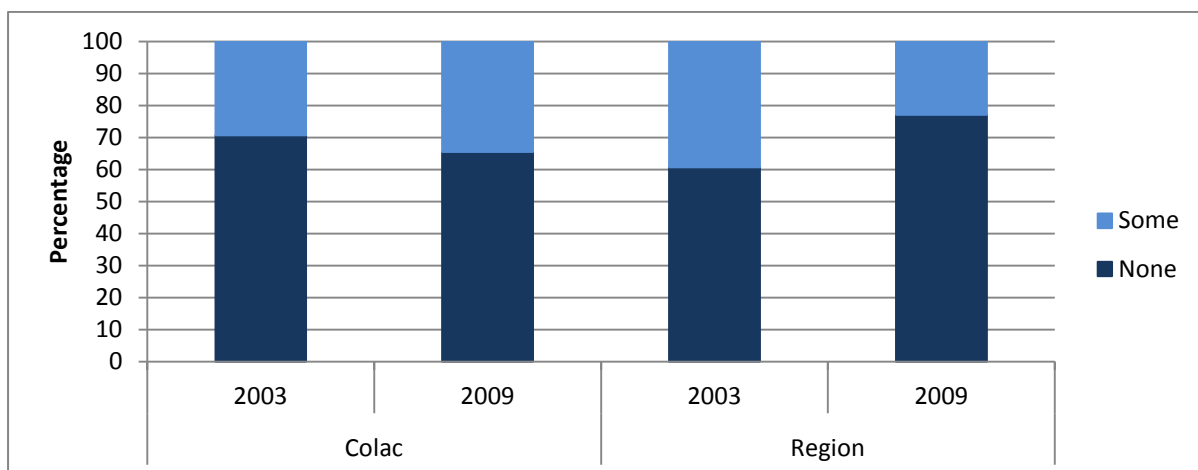


Figure 7: Grade 5 & 6 students self reported intake of soft drink 'yesterday'

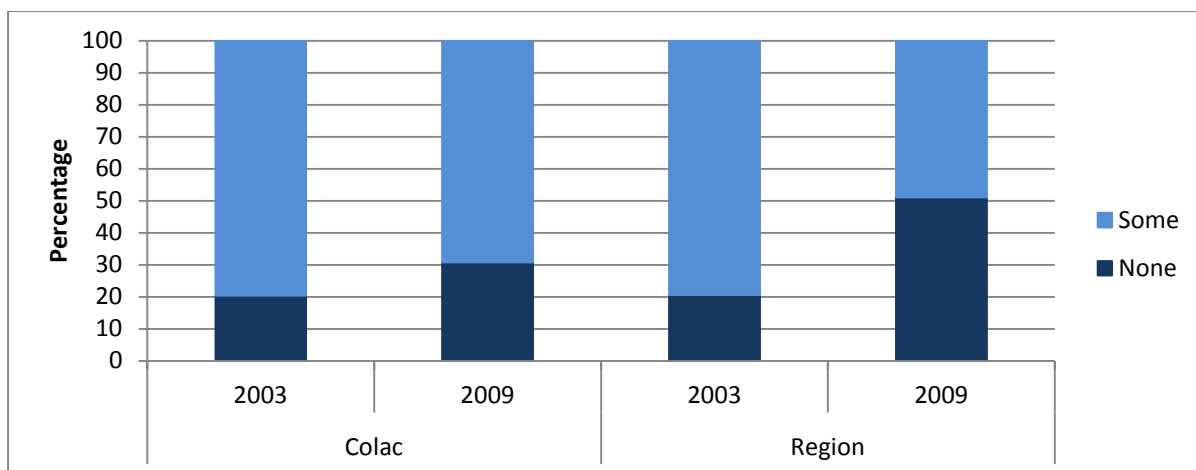


Figure 8: Grade 5 & 6 students self reported intake of fruit juice/cordial drinks 'yesterday'

Physical activity and sedentary behaviour patterns

- Watching TV for 2 hours or less 'yesterday' improved similarly in Colac (55% to 62%) and the Region (67% to 75%) (Figure 9).
- However, the opposite trend was noticed for playing electronic games with Colac children playing one hour or less 'yesterday' fell from 90% to 74% which was similar to children in the Region (91% to 88%) (Figure 10).
- Many children had a TV (~ $\frac{1}{3}$) or a computer (> $\frac{1}{2}$) in their bedroom.
- Active transport to school (walking or cycling) was relatively low and in Colac it fell slightly from 35% to 31% whereas in the Region it rose slightly (30% to 34%), but these changes were not statistically significant.

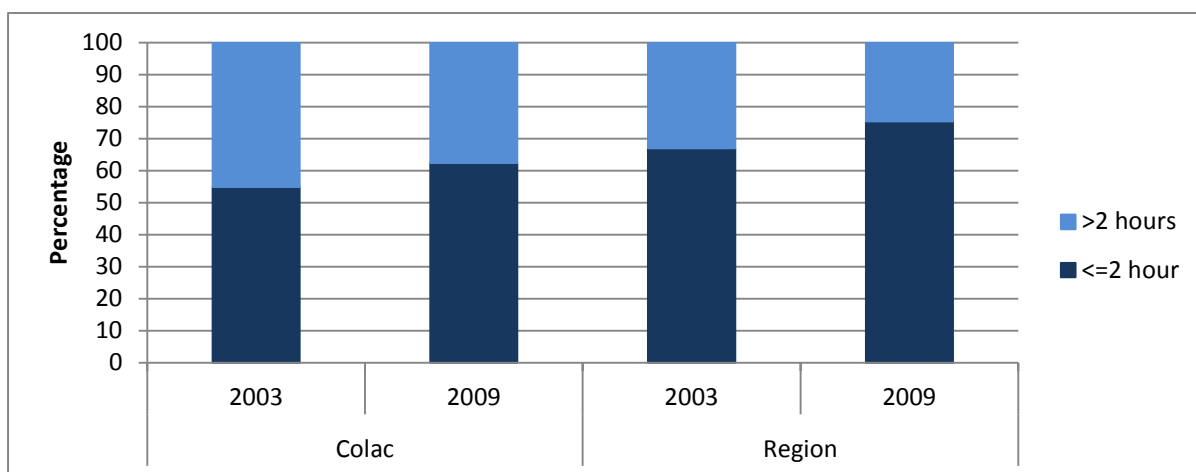


Figure 9: Grade 5 & 6 self-reported amounts of time spent watching TV/videos/DVD's 'yesterday'

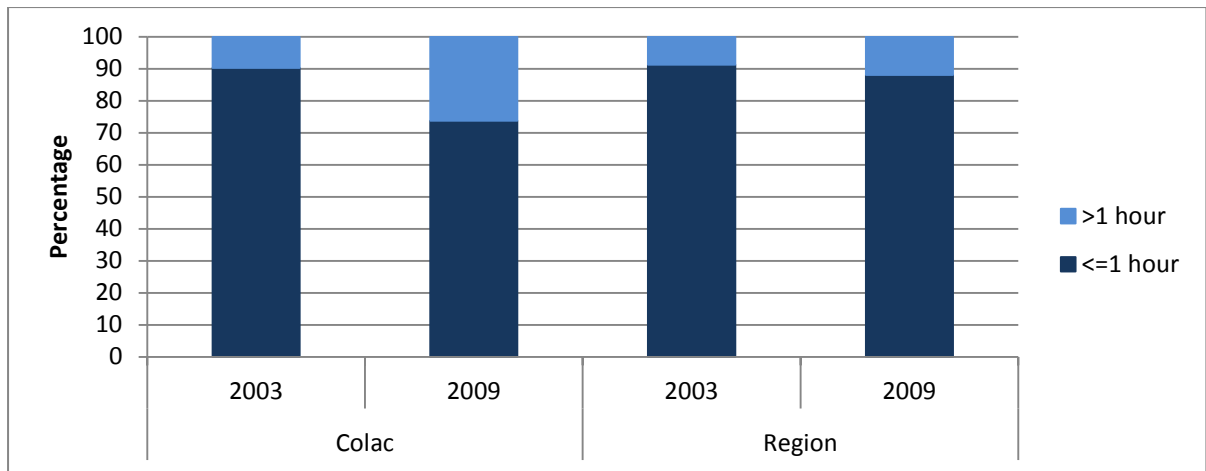


Figure 10: Grade 5 & 6 self-reported amounts of time students spent playing computer/electronic games 'yesterday'

Health, weight, and wellbeing perceptions

- About 80% of children felt they were not overweight and were rarely or never teased about weight and there were no differences between Colac and the Region.
- The proportion of children who felt happy about themselves changed from 2003 to 2009 and these were stable for Colac (69% to 67%) but rose in the Region (59% to 75%)
- The proportions of children feeling good about themselves generally were high and similar in Colac (83% to 80%) and in the Region (73% to 88%).
- The number of children who reported that they had tried to lose weight in the last 12 months was quite high and similar in Colac (63% to 56%) and the Region (53% to 53%) (Figure 11).

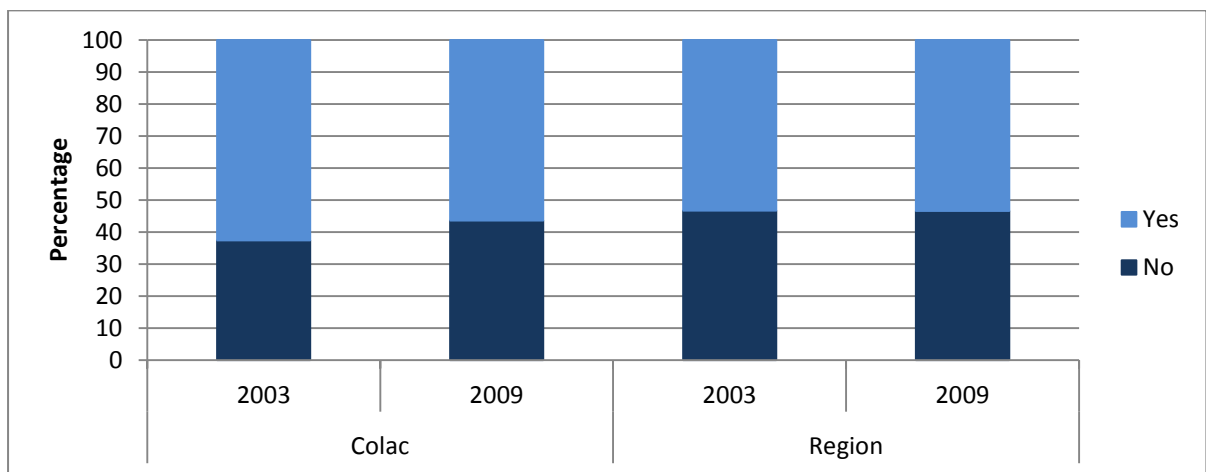


Figure 11: Percentage of students who have tried to lose weight in the last 12 months

The School Environment

The school environment was assessed using a 46 question, interviewer-assisted survey to capture the key elements of the nutrition and physical activity environments in primary schools. Respondents from each of the Colac and Region schools completed the survey on three occasions: 2003 (baseline), 2007 (post-intervention) and 2009 (three-year follow-up). The respondents were two or three staff members, generally principals, canteen managers, physical education teachers or classroom teachers.

The nutrition environment

In 2009, most schools had a healthy eating policy (83% in Colac and 70% in the Region). Details and differences of healthy eating policies are found in Figure 12. All schools encouraged a healthy diet and included food and nutrition in the curriculum.

Despite a high proportion of schools having a healthy eating policy more than half of teachers from Colac and a third of teachers from the Region DISAGREED with the statement “Our canteen service mainly provides foods with high nutritional value”. This is also reflected in the canteen menu analysis that shows no schools meet the recommended ‘Healthy Canteen Guidelines’ and will be described in more detail later in this section.

Physical activity environment

Most schools had a physical activity policy in 2009 (83% of Colac schools and 90% of schools in the Region). Details and differences of physical activity policies are found in Figure 13.

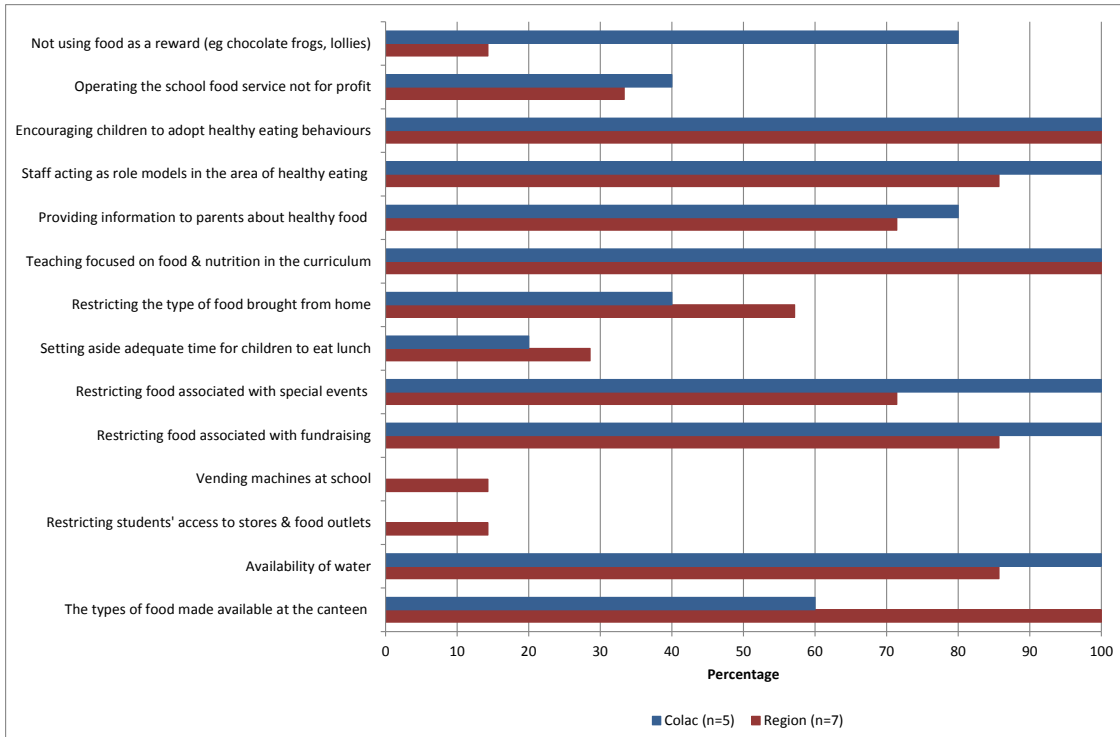


Figure 12: Key components included in schools' healthy eating policies, 2009

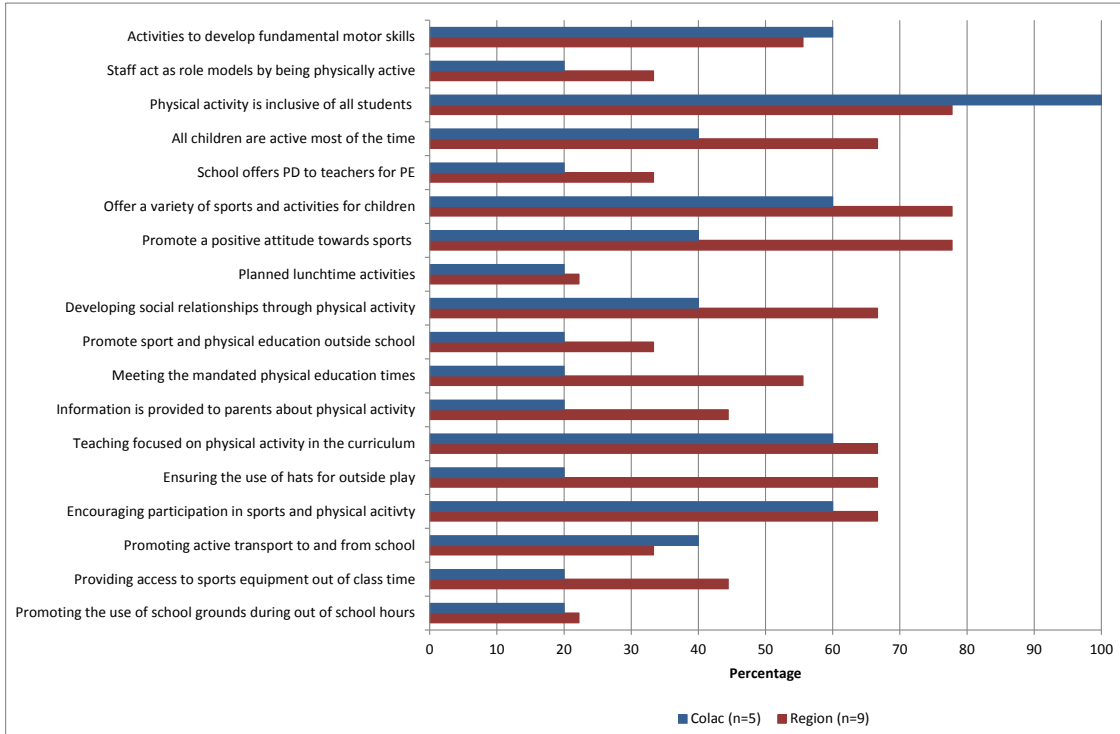


Figure 13: Key components included in schools' physical activity policies, 2009

Kids Go For Your Life – Program

Many schools were active members of the Kids Go For Your Life (KGFYL) program, with 67% of Colac schools and 50% of the Region schools registered as KGFYL schools. Of these, in 2009, 50% of Colac schools and 60% of Region schools had achieved KGFYL award status.

Canteen menu analysis

As part of the School Environment Survey, schools were asked to provide a copy of their canteen menu. In 2009, most schools had either an internal canteen service or an external food provider. One school in Colac and one school in the Region did not have a food service.

Figure 18 shows the foods on each school's canteen menu categorised based on their nutritional value using the 'Healthy Canteen Guidelines'[31] traffic light system of green for 'everyday foods', amber for 'select carefully foods' and red for 'occasional foods'. The recommendations are that food service menus should contain:

- >50% items from the 'green' category, as these are considered to be the most suitable for school canteen menus
- <50% 'amber' food and drinks; these should not dominate the menu as items contain valuable nutrients but also unhealthy ingredients
- food and drink in the 'red' category should not be included on the regular food service menus, however, they can be sold on up to two occasions during each of the four school terms.

Figure 14 shows that NONE of the Colac or Region schools met these guidelines - highlighting a major area of concern. Colac schools tended to have more red items on their canteen menus compared to Region schools, however both groups had considerably more red items than the guidelines recommend.

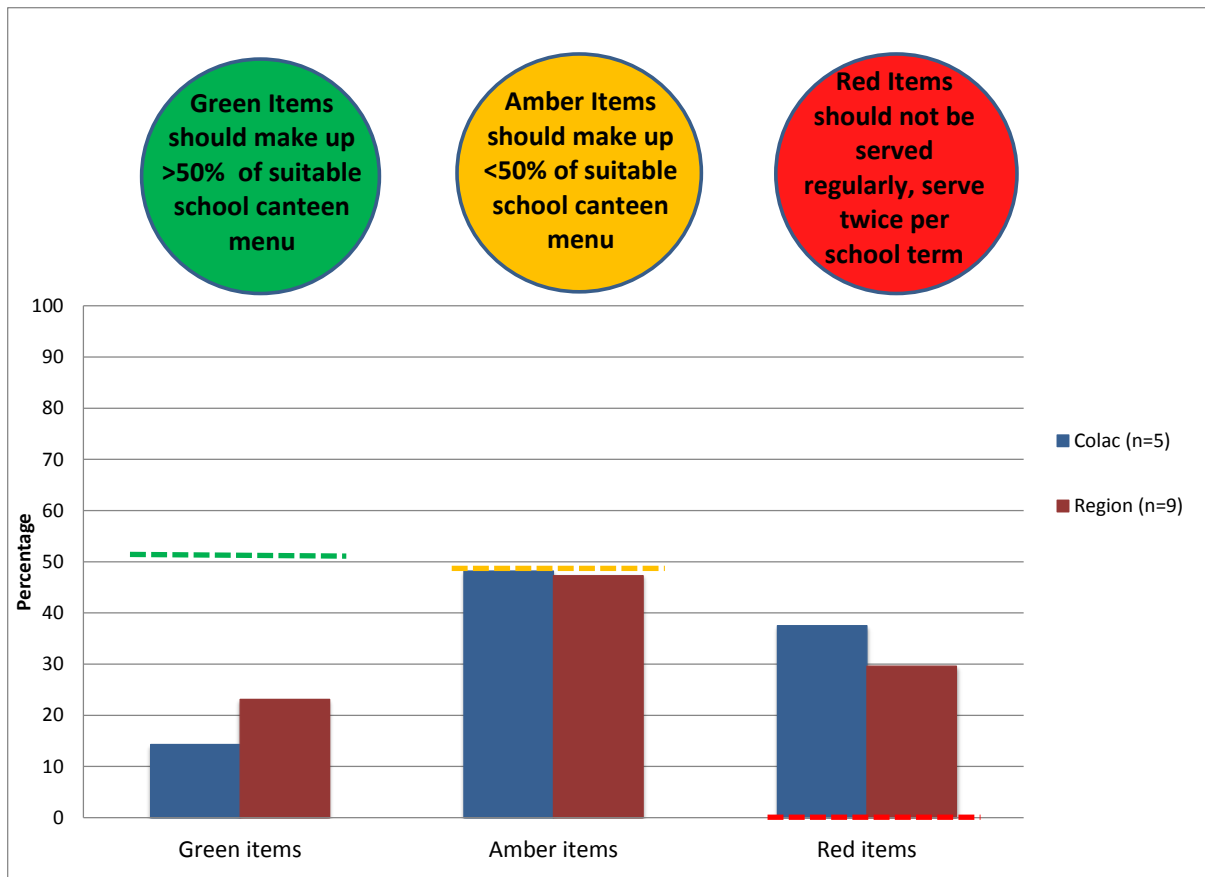


Figure 14: Average percentage of items classified as Green, Amber or Red on school canteen menus, along with the canteen recommendations

School Lunches

Surveys of the food and drink consumed by children were collected through the School Food Checklist which assessed the lunch-boxes of all consenting children from prep to grade 6.

Lunch Box survey: baseline and three-year follow-up

- Having two or more serves of fruit in lunch boxes increased similarly and significantly in both groups with no differences between the changes in Colac (10% to 29%) compared to the Region (14% to 32%).

- The proportion of children with more than 1 serve of non-core ('junk') foods in their lunch box remained similar for Colac (78% to 79%) compared to the Region (76% to 66%) which decreased significantly at follow-up (Figure 15).
- There was a large and significant decrease in the proportion of children bringing sweet drinks to school for both groups with no differences between the changes in Colac (58% to 86%) compared to the Region (76% to 91%) (Figure 16). This may be due to the introduction of Government policies and school guidelines banning sweet drinks.

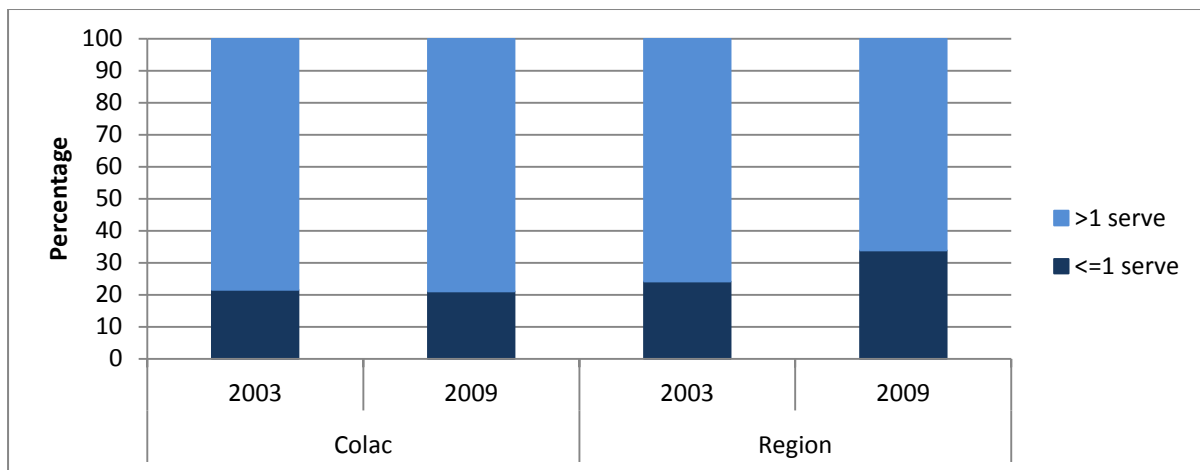


Figure 15 Non-core food brought in school lunch. Non-core food are snacks, biscuits and crackers, chocolate and lollies, muesli and fruit bars and cakes, buns, muffins and scones

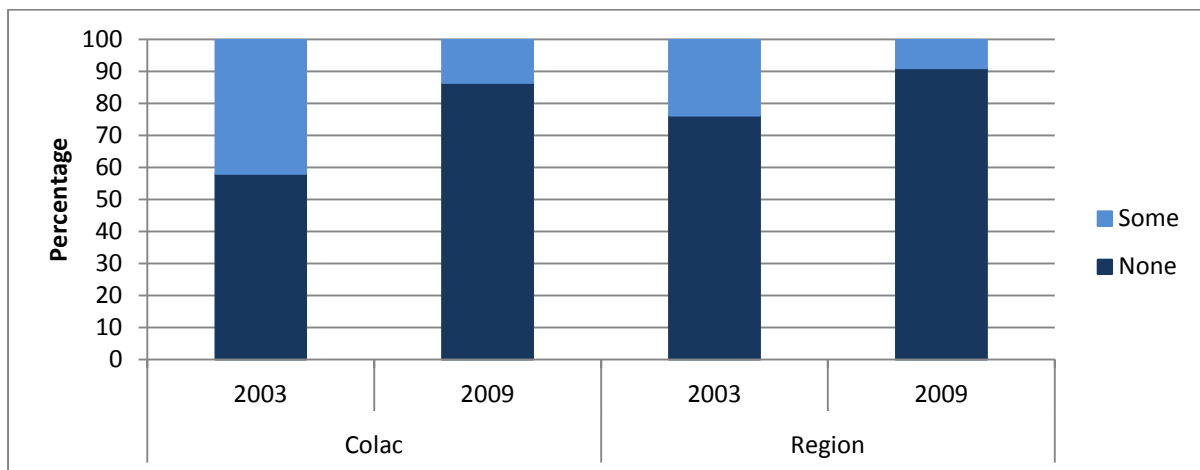


Figure 16: Sweet drinks (fruit juice/cordial/non-diet soft drinks) brought in school lunch

Regional audit of nutrition and physical activity programs

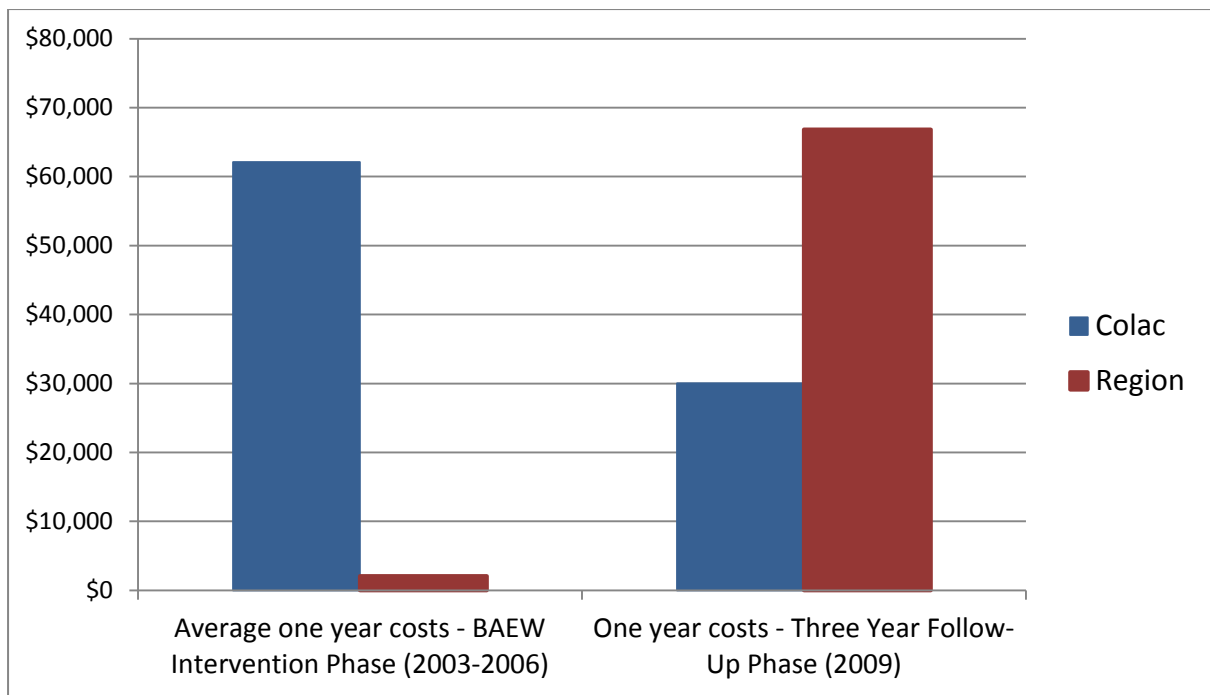
In 2009 an audit was conducted to identify and describe health promotion programs with nutrition and/or physical activity components targeting primary school aged children and their families across the Region. We aimed to examine the differences in nature and level of activity in 2009 and compare the number and type of nutrition programs to a similar audit conducted 2002 [32]. The audit in 2002 in the Region assessed only nutrition programs, and did not assess physical activity programs.

Since 2002, there had been an increased level of investment in nutrition programs and the 2009 audit identified 23 unique nutrition and/or physical activity health promotion programs targeting 5-12 year old children operating in the Region. Six of the programs were implemented in more than one local government area, and spread across the region, reaching areas of disadvantage. There also appears to be a shift in programs from single strategy to multi-strategy activities, funded by a mix of federal, state and local funding.

However, there were still many programs implemented that were short term and lacked recurrent funding. There was also considerable opportunity for enhanced coordination of health promotion activities. The 2009 audit also identified a lack of well-developed or funded evaluations for the programs and activities being implemented. This limits the potential for evidence generation, shared learnings across the region and monitoring of unintended consequences of the activities.

What's the ongoing investment in schools towards health promotion?

Data were collected prospectively on the investment of resources on physical activity and healthy eating during 2009, in order to determine costs of activity during 2009 at three-year follow-up. Each school in Colac and the Region maintained resource and activity logs, which specified activities undertaken and associated personnel time, equipment costs, travel etc. This only related to activities undertaken over and above those normally conducted as part of school curriculum (for example, physical education was excluded). The activity levels per school in the Region had substantially increased during the three-year follow-up phase. In 2009, they were twice as high as in the intervention schools (Figure 17).



^a Number of schools: Intervention schools in BAEW Intervention Phase and Three-year Follow-Up Phase (n=6). BAEW Intervention Phase (n=12), Three-year Follow-Up Phase (n=10).

Figure 17 Average total annual costs by school during the BAEW intervention phase and the three-year follow-up phase^a

Discussion

The BAEW intervention implemented in Colac (2003-2006), was found to be a safe, equitable program that was effective in reducing children's unhealthy weight gain and enhancing community capacity to promote children's health. We have now added the important information that BAEW was cost-effective as delivered and that there was a significant multiplier effect from the dollars invested in the community. We have also assessed the impact of BAEW on the community, school environment and children, three years since intervention completion. While the gains in community capacity have been sustained in Colac during the follow-up phase, the rest of the Region had become engaged in many more healthy eating and physical activity programs. Indeed, their investment in these programs in 2009 was more than twice that of Colac and this was reflected in some healthier behaviours in the Region. Surprisingly and very encouragingly, both areas showed a substantial decline in the prevalence of overweight and obesity from 2003 to 2009. However, some areas for improvement were also identified: no school canteen met the state guidelines for healthy food choices and; there was still a significant amount of non-core food in lunch boxes.

Health promotion and community capacity in the Barwon-South Western region of Victoria

In 2009, an increased level of health promotion activity was seen in the Region compared to Colac, with the Region investing on average, twice as much time and money into promoting healthy eating and physical activity for children than what was reported for Colac. Since the regional audit performed in 2002, there had been a range of state-wide initiatives promoting healthy eating and physical activity under the *Go For Your Life* campaign, which had also been supplemented by local government initiatives in many areas. In addition, there had been increased media attention on childhood obesity which increased awareness of the issue in many communities.

This study showed that the positive impacts of the BAEW intervention on community capacity had been sustained through to 2009, three years from the end of the program. This result reflected the strong sense of community and commitment to addressing childhood obesity that emerged from the evaluation.

"Oh, teachers very much committed and committed to change and to doing the hard yards and saying, you know, we are going to change this. It's not going to happen overnight but we

are determined that in the end we're going to have a really big impact particularly in our eating and physical side of thing ..."(teacher, Colac school)

However, it is important to recognise that Colac had higher levels of disadvantage compared to the Region. There was a suggestion that this gap may have widened since 2002 [33], but it was not possible to directly compare changes in the advantage/disadvantage scores over time because of changes to the score construction with each census, so this remains speculative. However, there were some supporting qualitative data for this to emerge from our evaluation and one school teacher in Colac commented about the changing role of schools in Colac in 2009:

"... it's a lot of single families that we now are seeing in our schools with no support. And single mothers who are just battling to keep their heads above water let alone... they try their best but it is becoming an enormous issue in our school. I spend most of my time now doing welfare things.... we're not just a school anymore" (teacher, Colac school)

Despite these challenges, community capacity to promote a healthy weight in children has been sustained. Of particular interest is the idea of 'catch up' by the rest of the Region and the reports from the interviews supported the data on increased investment and commitment to improving healthy eating and physical activity in the Region.

The school environment

BAEW was implemented largely in schools, and current evidence recognises the challenging nature of undertaking health promotion activities in this setting. The implementation of school policies and regulations, changing school practices related to social events and fundraising activities, and integrating health promotion into the curriculum are difficult to achieve and require long term action and high level support. Three years after the BAEW intervention, it is apparent that the school food service remains a concerning aspect of the school environment, often exposing children to low cost, unhealthy products.

In October 2006, the Victorian Government Department of Education and Early Childhood Development released the School Canteens and Other School Food Services Policy [34], which banned the sale of high sugar content soft drinks supplied in school food services from 2007, and required the phasing out of the sale of confectionary through the food service between 2007 and

2009. All schools (both in Colac and the Region) appear to require further actions, including training, support and accountability mechanisms to implement this policy as the food service menus assessed in 2009 do not meet the guidelines in any school.

Children's differences in health and wellbeing

This follow-up evaluation has shown that three years after the BAEW intervention the prevalence of overweight/obesity, children's weight and waist circumference were not different between children in Colac and in the Region. The gains made in preventing unhealthy weight gain in Colac children during the BAEW program had, by 2009, been matched and perhaps overtaken by the gains in the rest of the Region as overweight and obesity appeared to be dropping substantially across the whole Barwon-SW Region. A recent study showed a reduction in the prevalence of overweight and obesity in children aged under 5 years in Victoria [36], so this trend may be starting to appear in school-aged children. The level of reduction in overweight and obesity seen in this study appeared to be much more marked than the changes seen across the country, although much better monitoring systems are needed to assess this possibility more closely.

The follow-up evaluation also examined children's behaviours related to eating and physical activity and showed that, while there were no differences in favour of Colac versus the Region, a number of behaviours and measures of wellbeing were significantly better in the children from the Region. The behaviours of most concern were those related to the consumption of packaged snacks and sweet drinks, and the use of electronic games and screen-based recreation. Concerted and sustained health promotion activity at all levels will be required to address these behaviours.

Strengths and limitations

This study has provided a rare opportunity to evaluate the long term effects of a successful intervention to determine if the initial investment was cost-effective and if the impacts and outcomes were sustainable three years after the intervention period. It did this by using a comprehensive, mixed methods approach. Individual-level measures were captured using a cross-sectional design and as such we cannot determine the sustained impacts of the BAEW intervention

on the children assessed in the original longitudinal evaluation; the school and community level measures, however, were longitudinal. The moderate response rates of students in the schools within Colac (47%) and the Region (37%) places some limits on our ability to generalise these findings to all students in Colac and the Region, although they were consistent with the school and community response rates being achieved in recently reported obesity prevention studies [37]. The low response rates raised the possibility of selection bias with potentially only the children with healthier habits and body weight being consented to participate in the survey. The self-reported nature of the behavioural data is likely to be affected by recall bias in children of this age but is a widely accepted method in studies of this nature.

Conclusions

In conclusion, community capacity-building programs, such as BAEW, can have a significant effect on preventing unhealthy weight gain in children and the sustained gains in capacity seem to have translated into ongoing reductions in overweight and obesity prevalence. The intriguing finding that the original comparison communities appear to have caught up and overtaken Colac in efforts and results. There are several possible explanations for this finding. First, it may be due to selection bias with the overweight or obese children being less likely to participate in the measurement of height and weight, giving an apparent reduction in prevalence. The low response rate might support this explanation, however, the changes in prevention investment, community capacity, environments and behavioural data all follow a similar pattern to overweight and obesity prevalence. The second possible explanation is a 'Prevention Virus' effect whereby the prevention knowledge, skills, and ideas flow from Colac through the strong social and professional networks and media and stimulate action in others areas in the Region. There was some support in the qualitative data for this hypothesis. The third is that the start/finish nature of a project may have led to a slump in action at the end of the project in Colac, and there is evidence that their level of investment in prevention has dropped substantially between 2006 and 2009. This disinvestment in prevention is a major concern. A possible fourth explanation is that evolving, 'locally-owned' prevention activities using their existing resources or resources they have secured themselves (as occurred in the Region) are more sustainable than projects with externally supplied funding which may not have the same level of ownership and commitment. The final potential explanation is that a 'reverse Hawthorne Effect'

occurred. The Hawthorne Effect is the positive response that comes from just being measured and given some attention. It is possible that there was some reaction on the part of people in the Region against being a comparison population and missing out on external funding for health promotion programs, so that, in response, they got their own programs up and running. There was no evidence from the interviews with stakeholders in 2009 that there was a negative response in the region at being the comparison population for BAEW.

The other instructive finding of this study is the size of the reduction in overweight and obesity prevalence across the whole Barwon-SW region. This was substantial and it gives heart that childhood obesity can be substantially reduced using community-based approaches. It also suggests a need for a monitoring system for childhood obesity. Since obesity is one of the biggest health threats facing Australian children, it is imperative that it is measured so that trends can be monitored and interventions evaluated. A fine grained monitoring system can identify localities where progress is faster and where it is slower and many lessons can be learnt from this type of data.

The findings from this study will inform the implementation of the National Partnership Agreement for Preventive Health which will inject substantial resources from the Council of Australian Governments into community-level action for obesity prevention. The strategic approach for this important national initiative should be to translate the findings from existing studies, like BAEW, up to a national scale. This would best be achieved by strengthening the systems and programs available so that communities can implement them with the confidence that what they enact is evidence-based and supported by the systems and capacity necessary to ensure sustainability and constant improvement. The reduced prevalence of childhood obesity shown in this study gives renewed hope that this epidemic is reversible and that this may already be happening.

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The opinions, analysis and conclusions in this article are those of the authors and are not necessarily endorsed by the Victorian Government Department of Health, the Victorian Minister for Health or the Government of Victoria.

Appendix A

Be Active Eat Well related publications and other references

BAEW Published papers

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