# REPORT

# Community-based Interventions Targeting Healthy Weights among School-aged Children

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## Table of Contents


1.0 **BACKGROUND**……...…… 3

2.0 **COMMUNITY-BASED INTERVENTIONS TARGETING HEALTHY WEIGHTS AMONG SCHOOL-AGEDCHILDREN**……..…….…..... 5

THE FLEURBAIX AND LAVENTIE VILLE SANTÉ STUDY (FL)…….…….... 5

THE EPODE STUDY (ENSEMBLE PRÉVENONS L'OBÉSITÉ DES ENFANTS) - THE EPODE EUROPEAN NETWORK PROJECT …….. 6

BE ACTIVE, EAT WELL: A COMMUNITY BUILDING APPROACH ……..... 7

SHAPE UP SOMERVILLE (SUS)…….……... 8

SHAPE UP EUROPE…….…….. 8

3.0 **POLICY-BASED INITIATIVES/INTERVENTIONS**……. 9

4.0 **SCHOOL-BASED INTERVENTIONS**…….…….. 10

4.1 PRE-SCHOOL CHILDREN……..... 10

4.2 SCHOOL-AGED CHILDREN…….…. 11

5.0 **EVIDENCE SUMMARY OF THE EFFECTIVENESS AND IMPACT OF MULTI-LEVEL INTERVENTIONS, EDUCATION & AWARENESS, COMMUNITY MOBILIZATION**……. 20

5.1 PREVENTION EVIDENCE SUMMARY: DETERMINANTS OF WEIGHT GAIN AND WEIGHT MAINTENANCE (ENERGY BALANCE) IN CHILDREN……. 20

5.2 PREVENTION EVIDENCE SUMMARY: INTERVENTIONS TO RAISE AWARENESS…… 22

5.3 PREVENTION EVIDENCE SUMMARY: INTERVENTIONS FOR PRE-SCHOOL CHILDREN AND FAMILY-BASED INTERVENTIONS (EARLY YEARS)…..…….……..…. 25

5.4 PREVENTION EVIDENCE SUMMARY: SCHOOL-BASED INTERVENTIONS……. 29

5.5 PREVENTION EVIDENCE SUMMARY: INTERVENTIONS LED BY HEALTH PROFESSIONALS (COMMUNITY 1)…… 33

5.6 PREVENTION EVIDENCE SUMMARY: BROADER COMMUNITY INTERVENTIONS (COMMUNITY 2) ……..…… 38

6.0 **RECOMMENDATIONS**……. 42

6.1 GENERAL……. 42

6.2 SPECIFIC…….…. 42

6.2.1 SCHOOL/CURRICULUM…….. 42

PRE-SCHOOL…….. 42

SCHOOL-AGED CHILDREN……...…...… 43

6.2.2 COMMUNITY …… 43

FORGE STRATEGIC PARTNERSHIPS……..…. 43

BUILT ENVIRONMENT……..…. 44

6.2.3 EMPOWER LOCAL SCHOOLS AND COMMUNITIES……..…….... 44

6.2.4 MEDIA/INDUSTRY……..…….. 45

6.2.5 ADVOCACY/POLICY/GOVERNMENT…… 45

6.2.6 EDUCATE STAKEHOLDERS……..…. 46

6.2.7 EVALUATE OBESITY PREVENTION EFFORTS AND DOCUMENT THE BENEFITS OF OBESITY PREVENTION……..…….. 46

7.0 **CONSIDERATIONS FOR DESIGN OF INTERVENTION PROGRAM**…...…..……. 47

**APPENDIX I**: PROCESS, OUTPUT AND OUTCOME INDICATORS FOR EFFECTIVE AND PROMISING POLICY OPTIONS FOR PHYSICAL ACTIVITY IN SCHOOLS……...……..…… 49

**APPENDIX II**: LEVELS OF EVIDENCE FOR INTERVENTION STUDIES…… 51

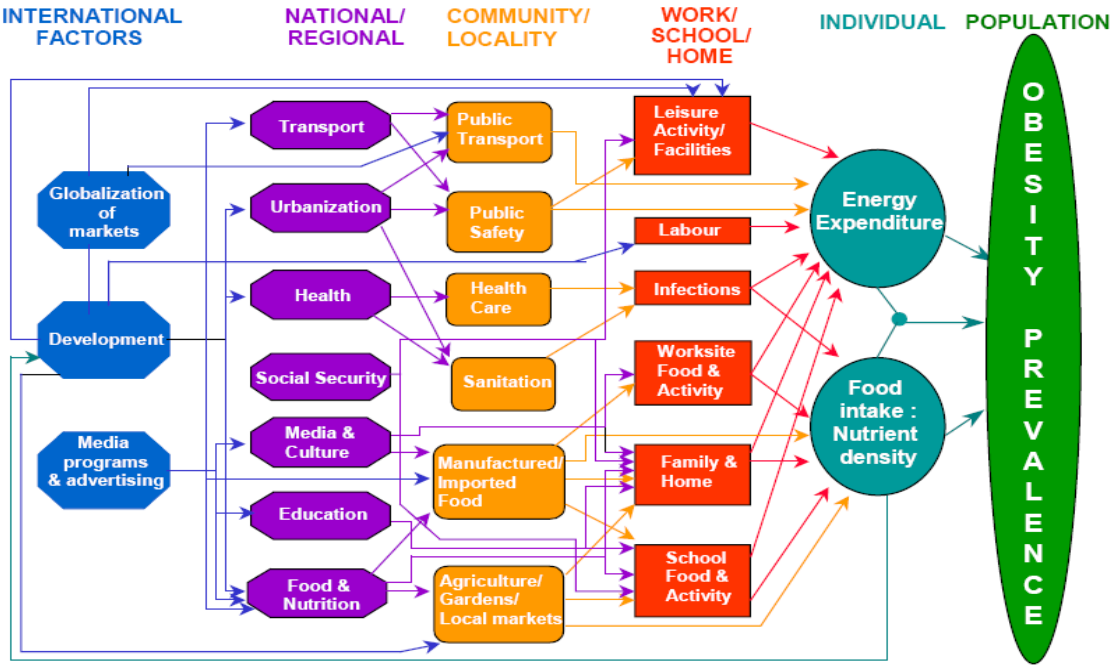
**REFERENCE LIST**…… 52

## 1.0 BACKGROUND

Prevention of chronic disease begins in childhood and the most significant chronic disease threat to Ontario children is obesity. The global epidemic of child overweight/obesity (OW/OB) is associated with an increase in risk for both metabolic and psychological co-morbidities [1]. Metabolic co-morbidities associated with OW/OB children include insulin resistance, metabolic syndrome, high blood pressure, dyslipidemia, impaired glucose tolerance (IGT) and Type 2 Diabetes Mellitus (T2DM). These metabolic co-morbidities increase the long-term risk for developing early cardiovascular disease (CVD), the leading cause of death in the developed world. Psychosocial co-morbidities associated with OW/OB in children include depression [2], diminished self-esteem [3], body image disturbance [4, 5], reduced well-being [6], and reduced quality of life [7]. The current generation of children is expected to be the first in over 100 years to see a reduction in life expectancy, and experts believe this is mainly due to increased obesity and inactivity that characterize today's youth. Many factors underlie this trend including greater access to sedentary leisure time pursuits (TV, video, computer, etc.), lower rates of active transportation which may be partially due to urban design, perceived unsafe environments for outdoor play, and pressures on schools to place a greater emphasis on academic achievement at the expense of physical education. A major concern regarding childhood obesity is that more than two-thirds of obese children will become obese adults [8-10]. However, there is data to suggest that youth show greater responsiveness to intervention than their older counterparts [11]. Given the obstinate nature of the condition once established, early and effective therapeutic intervention during childhood is paramount for any preventative strategy.

The battle against child obesity is a high priority in Ontario not only from a population health perspective, but from the health care system's economic perspective as well. The annual economic burden of obesity in Ontario is $2.35 billion, representing 5.3% of the total Provincial Health Care budget [12]. Moreover, 6 in 10 obese children have at least 1 risk factor for cardiovascular disease, and an additional 25% have 2 or more risk factors; [13] thus, the long-term health care burden is even more significant if we include the obesity associated chronic co-morbid conditions.

Figure 1: Childhood obesity is a complex issue that poses a number of challenges.




Source: International Obesity Task Force [www.iotf.org]

We must keep in mind that health is everyone's responsibility! Children have very little control over their food choices and/or PA options, particularly in the 'obesogenic' environment in North America, and thus the development of effective strategies to bring children into energy balance through managing caloric intake and subsequently expenditure activities to support healthy weight are essential. There are many stakeholders to be held accountable (Figure 2).

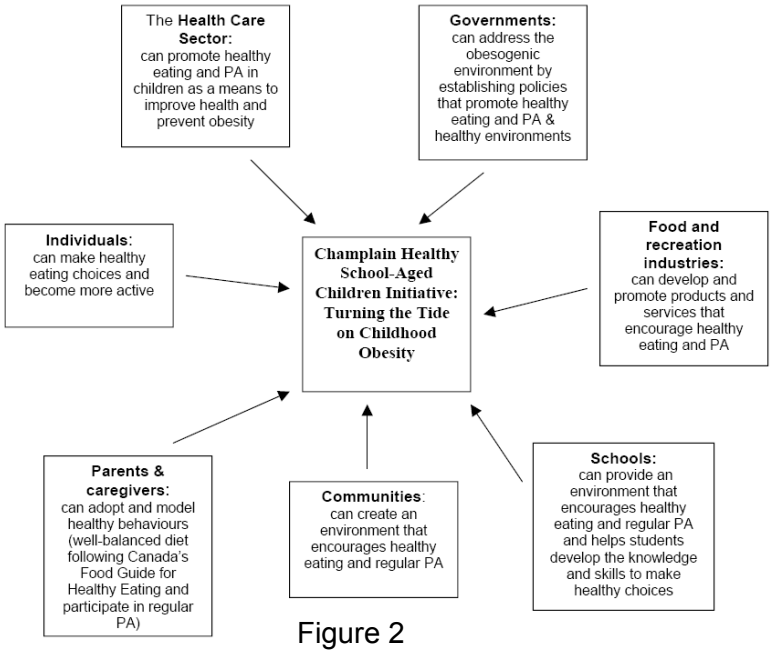


Figure 2

The obesity epidemic needs to be addressed by a public health approach as well as by interventions aimed at individual subjects. In practice, different prevention strategies are used (World Health Organization, 2000). First, intervention strategies are directed at the whole community, with the aim of stabilizing or reducing the mean BMI within a population (i.e. universal prevention). Second, selective prevention is directed at high-risk individuals (e.g. children of obese parents or at-risk ethnic populations). This strategy is concerned with improving the knowledge and skills of individuals to increase competence and personal autonomy, and thus, to prevent excessive weight gain. Third, targeted or secondary prevention or treatment is directed at overweight and obese children and adolescents to prevent further weight gain and/or to reduce body weight. School-based intervention is considered to be universal prevention, whereas family-based intervention may be considered to be selective (in the case of health promotion and education) or even targeted prevention (in the case of a structured treatment program).

Outcome measures of obesity prevention include objective measures of the nutritional state (e.g. BMI), co-morbidities (e.g. plasma lipid levels and blood sugars), health knowledge, behaviour (e.g. diet, physical activity, sedentary behaviour) and/or competence.

Suitable outcome measures differ between different strategies of prevention. Given the mandate of the **Champlain Healthy School-aged Children Initiative,** any intervention strategy developed will concentrate on universal and selective prevention. Outcome measures of universal prevention are: 1) a reduction in the incidence of overweight and obesity in the general population; 2) an overall reduction in the average BMI of the population; 3) improvements in nutritional intake, eating habits, exercise and other health-related activities; 4) improved knowledge, attitudes and norms relating to nutrition, weight, eating habits and exercise; 5) decreased rates of co-morbidities; and 6) public policy and environmental change indices.

A 2005 systematic review of the current RCT evidence suggests that many diet and exercise interventions to prevent obesity in children are not effective in preventing weight gain, but can be effective in promoting a healthy diet and increased physical activity levels [14]. While there is a growing body of studies on the prevention of childhood obesity, and more than half of school-based interventions aimed at preventing overweight and obesity show some improvement in health knowledge

and health-related behaviour, up to now, most have not had a significant impact on the weight status of the participating children (see Appendix II). Studies using targeted prevention strategies also improve health-related behaviour and are most successful (in terms of weight status) when parents are also involved in the intervention. The follow-up times vary considerably and, in most cases, the length of time over which interventions were being conducted was too short to modify weight status. Thus, at this point there is **not enough** evidence from trials to prove that any one prevention program can thwart obesity in children, [15] but it is suggested that comprehensive strategies that address both dietary and PA change, together with psycho-social aspects and environmental change, are likely to be most useful.

**For children and young people, it is accepted that the evidence base is far from complete and the amount of activity or dietary modification that is required to prevent obesity is unclear.**

## 2.0 COMMUNITY-BASED INTERVENTIONS TARGETING HEALTHY WEIGHTS AMONG SCHOOL-AGED CHILDREN

It is difficult to draw conclusions regarding interventions and their association with positive outcomes in the community and home settings as few studies are set in this environment. These are undoubtedly very challenging and costly undertakings; however, a large-scale policy of strategic initiatives employing macro-environmental or 'ecological' approaches may be essential if the public health impact of the childhood obesity epidemic is to be addressed [16, 17].

**Long-term interventions at the community level are larger scale trials involving all stakeholders. They have proven to be the only existing programs showing a significant decrease of the prevalence of OW and OB in the population studied.**

The French Fleurbaix-Laventie program (FL)[18] is one major initiative with community involvement which has successfully, over a 13-year period, stemmed the growth in childhood obesity rates in two communities, whilst the obesity rates in neighbouring communities have more than doubled. Proximity to citizens, tailoring of actions to the needs, and duration are critical factors of success. The EPODE (Ensemble Prévenons l'Obesité Des Enfants) program is building on the success of the FL study. It has been disseminated in France and aims at developing a best practice model for further replication in other European countries. In Australia, the 'Be Active, Eat Well' community-based project has also shown positive results in OB prevention as has the US-based Shape Up Somerville community intervention.

### The Fleurbaix and Laventie Ville Santé study (FL)

The FL study was designed to monitor trends in the prevalence of childhood overweight in two towns in northern France where a school-based nutrition information program was initiated in 1992, followed (from 1998 to 2002) by a longitudinal study of determinants of weight gain and an ongoing (2003-2008) whole-community intervention program. The aim of the study was to investigate changes in BMI and the prevalence of overweight between 2002 and 2005, and to compare (for the 2004-2005 school year) the prevalence of childhood overweight in FL with that observed in two nearby control towns.

As a whole, the Fleurbaix-Laventie (FL) Ville Santé study allowed for the measurement of the effectiveness of a whole-community prevention program on the prevalence of overweight including obesity over 12 years. Children aged 5-12 were assessed in FL and in two control towns between 1992 and 2004 using serial cross-sectional studies (n=804, response rate 81%). The interventions were performed in two steps. The first intervention (1992-2000) focused on nutrition education in schools. The second intervention (2000-2004) involved the whole FL population (families and children) in community actions targeting physical activity and nutrition. Twelve years after its inception, the difference in the prevalence of OW/OB children between FL and control towns was significant (8.8 % vs. 17.8 %; $p < 0.0001$).

This community-wide prevention program successfully reduced childhood OW/OB; however, it took more than 8 years for the decline in prevalence to become apparent, indicating that interventions targeting schools only are not efficient enough. The involvement of the whole community is necessary to reduce the prevalence of childhood obesity. This successful childhood obesity prevention program is the only intervention study showing a reversal of trends in the prevalence of childhood overweight through a 12-year community-based nutrition program.

## The EPODE study (Ensemble Prévenons l'Obésité Des Enfants) - The EPODE EUROPEAN NETWORK project

The EPODE Program developed in France (January 2004) is based on the Fleurbaix-Laventie experience, which led to the stabilization of the prevalence of childhood obesity since 1992 in the two involved cities. The EPODE French initiative is a widespread program involving 10 pilot French cities and mobilizing each and every citizen for a healthier lifestyle. It consists of concrete preventive initiatives, made with the help of local stakeholders, setting up prevention at the heart of the city network, and under the control of a scientific committee. The entire community is involved in the prevention strategy developed and proposed by the EPODE program, which incorporates strategies involving a more diversified and balanced food intake and more daily physical activity.

The involvement of municipalities is therefore a springboard for this ambitious program, which aims to curb the progression of childhood obesity and implement a sustainable new culture of educating children and families on their life habits. The EPODE methodology is based on widespread involvement and training of local stakeholders to establish and carry out the actions. It can be summed up in 4 fundamental steps:

(i) Informing and making all players aware of the problem and of its solutions;
(ii) Educating the participants to relay correct and positive messages based on international recommendations with the help of trained local experts;
(iii) Taking concrete actions in schools and towns, around the tools and methodologies developed by the EPODE European coordination and also around local initiatives consistent with the program's philosophy and validated by a national scientific committee; and,
(iv) Assessing the efficiency of the program by measuring the evolution of the children's BMI, the number of stakeholders involved and the quality of spontaneous actions undertaken.

EPODE's philosophy is also focused on a positive apprenticeship of a balance of food and physical activities. It is particularly careful not to stigmatize obese people or children and it aims at helping and

carefully advising children and parents on their food choices. The pedagogy is based on apprenticeship through experience, such as cooking classes, taste experiences, agriculture discovery sessions, family breakfasts organized at schools with the monitoring of dieticians, walking to school days, games to be practiced outdoors on weekends, and adapted school yards. Through cross-cutting initiatives, it fosters pleasant, affordable and diversified food choices as well as fun physical activities, not only for the children, but for the whole family. Furthermore, the program sets up a new philosophy of health prevention for 'real life' where everyday choices are made in order to obtain sustainable optimal results and involvement of the stakeholders.

Carrying out such a program is primarily based on the mobilization of existing resources, and thus is quite affordable, estimated to be about 2€ per person per year. As a key factor of success, the EPODE program includes a widespread communication and public relation plan including yearly meetings to facilitate best practices sharing. The success will be measured by a large field mobilization in the French pilot cities – more than 1,000 actions have been implemented by the local stakeholders during the recent years. This may lead other European countries to consider implementation of a similar program as they too face a spectacular rise in childhood obesity.

The preliminary results from the EPODE program in pilot projects that are currently running in France are very promising. More pilot programs are being/will be started up in Belgium, Spain (2006), Greece and Poland (2007). Knowledge and experience gained in these projects will be used to further adapt the methodology and establish a European standard. The ultimate goal of the EPODE European Network (EEN) project is to launch the "EPODE European methodology book" that would serve as a basis for the implementation of EPODE programs in any European city. This handbook would be supported by other structures that facilitate easy access of information (database, website).

## Be Active, Eat Well: A community building approach

The goal of this 4-year project, targeting children between the ages of 2 and 12 years in Colac, Victoria Australia (population 11,000), was to improve the health and well-being of individuals and strengthen communities through coordinated initiatives based on healthy eating and PA promotion. The objectives included: building community capacity to promote physical activity and healthy eating; achieving a high awareness of the "Be Active, Eat Well" messages among parents and children; to decrease screen time (TV, computer or electronic games); to decrease the consumption of high sugar drinks as well as the consumption of energy dense snacks while increasing consumption of fruit; to increase the proportion of primary school children who walk or cycle to and from school and to increase the amount of active play after school and on weekends; to provide a service to improve the food and physical activity choices for children with or at risk of overweight; and finally, to pilot a healthy lifestyle program for parents and caregivers of children aged 2-12 years, focusing on healthy eating, physical activity and parenting skills, and evaluate the process, impact and outcomes of the "Be Active, Eat Well" project.

There were multiple components to this project, which began with establishing strategic alliances, partnering with community leaders and the Department of Human Services. Prevention strategies implemented during this project were a social marketing campaign re: awareness of the project, school curriculum changes that address children's excessive screen time, the development of school water and nutrition policies, the development of Be Active, Eat Well Lunch Pack program, and the establishment of a walking bus program and an After School Activity Program (ASAP).

About 1,800 children took part in the four-year comprehensive intervention and this community-based project managed to significantly reduce obesity in children. Children watched 20 per cent less television

and drank almost 70 per cent fewer sweet drinks, while there was almost a 70 per cent increase in participation in after-school sport. Parents were shown how to buy and cook healthier foods and changes were made in the food sold at school tuck-shops and thus, children participating in this community-wide program stayed a kilogram lighter and had waist circumferences 3 cm smaller.

## Shape Up Somerville (SUS)

Shape Up Somerville (SUS): Eat Smart, Play Hard is a multi-faceted, collaborative, community-based participatory research initiative designed to change the environment to prevent obesity in early elementary age children. The intervention was a non-randomized controlled trial and included children in grades 1-3 from 3 socio-demographically matched communities (1 intervention city: Somerville Massachusetts n=385 and 2 control communities in the surrounding areas n=793) studied over a 3-year period (2002-2005). The intervention activities were developed to influence every part of an early elementary school child's day. The intervention included multiple before school, during school, after school, home and community components (http://nutrition.tufts.edu/research/shapeup) designed to result in an increased energy expenditure of up to 125 kcal/day while keeping pace with energy intake required for growth and development. Multiple groups and individuals within the community (children, parents, teachers, school food services providers, city departments, policy makers, health care providers, before and after school programs, restaurants and the media) were engaged in the intervention. Various community-wide policies were developed to promote and sustain change. These included a school wellness policy, new policies in union contract negotiations that lead to enhancements of the school food service, expanded pedestrian safety and environmental policies, as well as the adoption of a healthy meeting and event policy.

The results after 1 school year indicate that the children's BMI z-score significantly decreased in the intervention community versus the control communities [19]. This model demonstrates that a multi-faceted environmental change approach involving the community, schools, families and students holds promise for communities confronted with escalating childhood obesity rates.

## Shape Up Europe

SHAPE UP EUROPE is a new project developed as a direct response to the EU Platform on Diet, Physical Activity and Health to help address childhood obesity in all 25 member states.

SHAPE UP is a 3-year school-community project in 26 cities, which will develop, test and evaluate a new approach to influence the determinants of a healthy and balanced growing up. Children will contribute to changes in their community that are expected to impact their health and well-being. The project will involve all EU member states, taking into account different cultural and geographical settings.

SHAPE UP aims to involve pre-school, primary and secondary school children from 4 to 16 years of age and will include a minimum of three schools per city. SHAPE UP will also provide guidelines, materials and finance for specific actions in and out of school, and co-fund with the participating cities the hiring of two dedicated staff members in each city. A SHAPE UP promoting group will be convened with the support of the city council to assist children and families with the development of initiatives. An internet portal will also help promote exchange among teachers and students about activities

developed in participating cities, as well as facilitate best practice sharing at the European level. This unique network will extend beyond the project itself as experiences, achievements and results are shared.

## 3.0 POLICY-BASED INITIATIVES / INTERVENTIONS

Addressing obesity (and its co-morbidities) in children should be a major focus of government policy. The rising tide in childhood obesity has led to multiple calls for evidence reviews and policy responses in many countries and governments around the world (see Table I). Thus, a range of recommendations have resulted and a combination of government and/or industry responses have led to programs for after school activity, vending machine policies in schools, strategies to replace sweet drinks with water or healthier choices, more stringent nutrition labeling on food products, walking school bus systems and active transport, as well as modifications to school lunch programs. However, there has been little systematic examination of policy-based interventions; generally they are implemented without thought of accountability or measurement.

Recognizing the importance of introducing good dietary and activity habits early in life and the opportunity the school environment provides, a raft of Provincial and Federal government policy initiatives and interventions which aim to improve children's diets and activity levels have been introduced in recent years. These include:

| **Table I: Canadian Policy-based Initiatives** | |
|---|---|
| Effective Public Health Practice Project (EPHPP) | http://www.hamilton.ca/phcs/ephpp/ |
| Addressing Childhood Obesity: The Evidence for Action | http://www.caphc.org/partnerships_obesity.html |
| ParticipACTION | http://www.usask.ca/archives/participaction/ |
| Go for Green - Walking School Bus | http://www.goforgreen.ca/asrts/home_e.html |
| Action Schools! BC | www.actionschoolsbc.ca |
| Healthy Alberta Schools Initiative | http://www.gov.mb.ca/healthyschools/about/index.html |
| Nutrition in Saskatchewan Schools: Policy, Practice and Needs | http://ww2.heartandstroke.sk.ca/Images/English/SK-Nutrition-Report-April-2004.pdf |
| Manitoba: Healthy Kids, Healthy Futures Task Force | http://www.gov.mb.ca/healthykids/docs/finalreport.pdf |
| Ontario Ministry of Education: Healthy Foods and Beverages in Elementary School Vending Machines Policy / Program | http://www.edu.gov.on.ca/extra/eng/ppm/135.html http://www.dietitians.ca/news/downloads/DCRpt1_Eng_OntarioSchoolFood.pdf |
| Ontario Ministry of Education: Healthy Schools | |
| Ontario Ministry of Education: Daily Physical Activity | |
| Ontario Ministry of Education: Community Use of Schools | http://www.mhp.gov.on.ca/english/sportandrec/schools.asp |
| Ontario Ministry of Health: Eat Smart! | |
| Ontario Society of Nutrition Professionals in Public Health: Call to Action - Creating a Healthy School Nutrition Environment | http://www.osnpph.on.ca/pdfs/call_to_action.pdf |
| L'initiative Écoles en santé Québec | http://www.mels.gouv.qc.ca/DGFJ/csc/promotion/pdf/19-7062.pdf |
| New Brunswick: Healthy Learners in School Program | http://www.gnb.ca/0053/programs/healthylearners-e.asp |
| Nova Scotia Health Promoting Schools Initiative | www.hpclearinghouse.ca/features/AVHPSP.pdf |
| Healthy Eating Strategy for Island Children & Youth | http://www.gov.pe.ca/photos/original/hss_hea_2002.pdf |
| Prince Edward Island Strategy for Healthy Living | http://www.gov.pe.ca/photos/original/hss_hl_strategy.pdf |
| Newfoundland and Labrador: Healthy Student, Healthy Schools Initiative | http://www.health.gov.nl.ca/health/publications/2006/wellness-document.pdf |

Although some of these initiatives are relatively new, others have been in development or operating for several years. Some have been tested as part of the development process for these government-based initiatives and others have been operating independently as part of ongoing health promotion activities.

**Despite these attempts, it is becoming increasingly clear that decision-makers need more information upon which to base policy and program decisions.**

Two very important areas for policy intervention not touched on in Table I include fast-food establishments and food advertising. Unfortunately in our obesogenic society, many fast-food restaurants are concentrated within a short walking distance from schools, exposing children to poor-quality food environments in their school neighborhoods [20]. It is known that children spend more time with media than any activity other than sleeping [21]. Given an average of 10.65 food advertisements per hour [22] and a television viewing average among pre-teens approaching 3 hours/day, the typical child aged 6-11 years would be exposed to approximately 11,000 food advertisements each year. Snack, convenience, fast foods and sweets continue to dominate food advertisements viewed by children. For the most part, advertised foods exceed the recommended daily intakes of fat, saturated fat, and sodium and, in spite of the widespread adoption of nutrition labeling, foods advertised during the television programs children watch most remain nutritionally unbalanced. Nutrient-poor, high-sugar foods are particularly prevalent in advertisements aimed at children [22]. If these advertisements influence children's food purchase requests to their parents [23, 24], the same advertisements probably influence the choices children make when buying foods themselves.

If we truly want to make a difference, these issues will need to be addressed (see Recommendations sections 6.2.2 & 6.2.4).

## 4.0 SCHOOL-BASED INTERVENTIONS

Schools are one of the critical settings for promoting PA among children and youth since they reach a high proportion of children and they spend a large proportion of their time in this environment.

### 4.1 Pre-school children

The pre-school years are not only critical for physical and emotional development, but they are also likely to be important for learning attitudes and practices related to healthier lifestyles. Lifelong habits, which can have an impact on an individual's ability to maintain a healthy weight, may be established during the pre-school years (see Recommendations section 6.2.1).

The family environment has a tremendous influence on a child's development, his/her eating and activity habits, and predisposition to overweight [25, 26]. Similarities within families are documented in relation to eating and exercise behaviour and body weight [25]. This clustering of family characteristics suggests the value of the family as a critical unit upon which obesity prevention and intervention strategies can be developed. For example, the nutrient quality of the diets of 2–5 year old children is influenced by the eating patterns of their parents [27]. Children's eating behaviours are influenced by: the family/caregiver food environment, including parental food preferences and beliefs; children's food exposure; role modeling; media exposure; and child/parent interactions around foods [28-30]. Similarly, children's activity levels will be strongly influenced by, for example, parental decisions on car use and walking, family television viewing habits, and leisure time activities.

### 4.2 School-aged Children

The school years are known to be a key stage in the life course for shaping attitudes and behaviours. Indeed life-long habits, which can have an impact on an individual's ability to maintain a healthy weight, may be established during the school years. All school policies have the potential to have some impact on a child's ability to maintain a healthy weight, eat a healthy diet, and be physically active (see recommendations 6.2.1). These range from the school selection processes themselves (which may determine whether a child can walk or cycle to school), to the curriculum content, school food policies, training opportunities for all school staff, engagement with wider community, and the extent to which municipal/provincial/national policies are implemented (see Appendix I: Process, Output and Outcome Indicators for Effective and Promising Policy Options for Physical Activity in Schools).

The majority of Canadian school-aged children do not consume nutritionally balanced or adequate diets. Only 20% of children aged 6-12 consume the recommended daily amounts of fruits and vegetables [31] and 50% of this age group does not consume any milk products for lunch [32] while 1/3 of Ontario students in grades 4-8 consume soft drinks daily [33]. Fewer than half of school-aged children meet the dietary recommendation for total fat intake and only 8% the recommendation for saturated fat intake. About 28% of youth in grades 6, 8, and 10 eat candy or chocolate bars every day, and about 22% of boys and 15% of girls in grade 6 eat potato chips every day [34]. Thus, over half exceed the maximum recommended salt intake and only 15% meet the maximum recommended intake for added sugars. Similarly, Active Healthy Kids Canada's 2007 Report Card on Physical Activity for Children and Youth, has given Canadian children a failing grade in physical activity levels for the 3rd straight year with 91% of children and youth not meeting the Canadian Physical Activity Guidelines for Children and Youth [35].

Only a select few obesity prevention interventions aimed at elementary and middle schools have been successful in modifying obesity risk over the short term or in slowing the increase in OW/OB. Most disappointing is the fact that very few have demonstrated a reduction in OW and OB prevalence, while evidence of no benefit is much more common, particularly in those with longer follow-up (Table II).

## Table II: Obesity Prevention Studies: School-aged Children

| Study Name/ Author | Population | Design | Change in BMI / Body Composition | Other Results |
|---|---|---|---|---|
| **PA ONLY** | | | | |
| Tuckman [36] | 154 school children grades 4-6 | RCT- 12 weeks<br>INTER= running program consisted of three 30-min sessions per week in lieu of attendance in regular physical education classes<br>CON= normal classes | ↓ (body fat in boys)<br>↔ (in girls) | - better 800 m running times<br>- lower HR |
| Hansen [37] | 69 Danish children with high BP and 68 with normal BP 9-11 yo | RCT- by child 8 mos<br>INTER= 3 extra PE lessons/wk | ↔ (BMI) | - increased fitness |
| Alexandrov [38] | 1005 School children (11-12 yo) from 2 districts in Moscow | CCT - 1 yr with 3 yr follow-up<br>- 477 in intervention vs. 528 in control<br>INTER= counseling, nutrition education, dietary change, PA and smoking prevention (both children + parents) over 1 year and more intense for high risk group | ↓ (BMI @ 1 yr)<br>↔ (BMI @ 3 yrs) | |
| SPARK [39] | 549 children (mean age=9.25 yo) | RCT cluster (6 schools randomized)<br>2 specialist led vs. 2 teacher led vs. 2 control<br>- kids to be provided with 3, 30 minute sessions of high level PA/wk | ↔ (BMI) | |
| US Flores [40] | 110 US children (10-13 yo) | RCT by class - 12-week<br>INTER= health education 2x/wk + 50 min. dance oriented PE 3X/wk)<br>CON= normal curriculum | ↓ (BMI girls)<br>↔ (BMI in boys) | |
| Stephens [41] | 99 US low-income, minority, urban elementary school children (grade 4) | RCT - 15-week<br>2 schools<br>INTER= 3 extra PE classes/week | ↓ (skinfolds) | - decrease weight gain<br>- increase fitness/flexibility |
| Thailand [42] | 292 kindergarten children | RCT - 29 weeks<br>Exercise class vs. control<br>15 min walking + 20 min aerobic exercise 3x/wk<br>CON= usual PE classes | ↓ (prevalence of OB) | |
| McMurray [43] | 1140 students from 5 US schools<br>11-13 yo | RCT - 8 wk intervention<br>- control<br>- exercise only | ↔ (BMI)<br>↓ (skinfolds) | |

| | | | | |
|---|---|---|---|---|
| | | - education only<br>- education + exercise | | |
| New Moves [44] | 201 US girls from 6 schools (14-18 yo) | RCT - 24 weeks<br>3 intervention vs. 3 control<br>- intervention targeted girls unlikely to attend after school clubs with BMI > 75th percentile<br>INTER= addressed behavioural factors & PA 4x/wk<br>- nutrition and social support bi-weekly | ↔ (BMI) | - positive changes in behaviour in intervention group<br>- girls enjoyed the intervention and the school has thus carried on |
| Promoting Lifestyle Activity for Youth (PLAY) [45] | 606 US children (9-10 yo) | RCT – 12 weeks<br>Randomized by school into 4 conditions<br>- PLAY & PE<br>- PLAY only<br>- PE only<br>- control | ↔ (BMI) | - girls in PLAY+PE and PE only intervention groups were significantly more active<br>- No difference in boys |
| Rowland [46] | 21 primary schools in London | RCT- by school- 1 academic year<br>INTER= advice from school travel coordinator re: school travel plans | ↔ (BMI) | - more INTER schools had travel plans but proportion of children actively transporting was similar |
| Project FAB [47] | 47 sedentary adolescent females in Britain<br>grades 9-10 | RCT by school- 4 mos<br>INTER= special PE classes | ↔ (BMI) | - increased fitness and physical activity (light, moderate & vigorous) |
| Girls on the Move [48] | 77 racially diverse girls grades 6,7 & 8 | Each grade randomly assigned to either intervention or control (12 weeks)<br>INTER= computerized individually tailored PA feedback messages, counseling by nurse practitioner & telephone calls/mailings from research assistant<br>CON= handout listing PA recommendations | Not measured | - no difference in self-reported PA but intervention had greater social support |
| KISS [49] | 1st & 5th grade students in Switzerland | RCT- by school - 1 academic year<br>9 schools randomized to intervention vs. 6 control stratified by urban/rural<br>INTER=2 extra PE classes/wk total =5 classes/w, short PA breaks (2-5 min) during academic lessons each day, PA home work, change in recreational areas around schools, encouragement for active commuting and PA family time, promotion of less media time<br>CONT= normal curriculum, minimal nutrition information was given to both groups… | **ONGOING** | |
| Canadian Learning to be Active in School Study | 3rd grade student in French and English schools | 12 week intervention- observational before & after study<br><br>Program of kinaesthetic learning- teachers were to | Not measured | - lower observed classroom time 'lying/sitting', & more 'standing' was noted.<br>- MVPA increased & sedentary |

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| (CLASS)[50] | | teach regular classes in an active manner for 10 min, 3x/day | | activities decreased |
| **DIET & PA** | | | | |
| Know Your Body [51, 52] | 1041 students from 9 US schools grades 4-6 | RCT- by school (5 yr)<br>INTER=teacher-delivered primary intervention fociused on diet, physical activity, and cigarette smoking prevention | ↔ (BMI) | - increased fitness<br>- decreased fat intake |
| West Australia Study [53] | 971 Australia children from 30 schools<br>10-12 yo | RCT nutrition and fitness programs - 36 wks<br>FIT- daily fitness programs and PE classes.<br>SN- lessons given by teachers to improve knowledge, attitudes and eating habits<br>FIT + SN<br>HN- nutrition messages to parents through homework<br>SN+HN | ↔ (BMI) | |
| Howard [54] | 83 US children 9-12 yo | RCT -1 month intervention & F/U 1yr<br>Intervention= lifestyle education, diet, PA, antismoking vs Control=usual education | ↔ (BMI or skinfold) | |
| Donnelly [55] | 338 US children in grade 3-5; 8-12 yo from 2 schools | CCT - 104 weeks<br>102 intervention vs. 236 control<br>- school based interdisciplinary trial<br>INTER= aimed to reduce E I/T via kitchen staff<br>- 30-40 min PA 3x/wk (lifestyle aerobic rather than competitive games) | ↔ (BMI) | - significant changes in food in food provided at intervention schools<br>- small but significant increases in amount of PA undertaken in class but this appeared to result in compensation outside of class |
| CATCH [56] | 96 US schools (5363 students INTER & 3724 control)<br>grade 3-5 | Multi-centre RCT cluster randomized by school- 2.5 yr intervention<br>56 intervention vs. 40 control in 4 centres (California, Louisiana, Minnesota, Texas)<br>INTER=school food service modifications, enhanced physical education (PE), and classroom health curricula. Twenty-eight additional schools received these components plus family education<br>CON= normal PE program | ↔ (BMI) | - INTER decreased % of energy intake from fat<br>- intensity of PA in PE classes increased significantly in the intervention schools<br>- Self-reported daily energy intake from fat was reduced among students in the INTER schools<br>- INTER students reported significantly more daily VPA |
| Burke [57] | 1147 students in Australia<br>10-12 yo | RCT cluster randomized by school- 1 yr<br>INTER= Fitness, fitness+school nutrition, school +home nutrition or home nutrition programs<br>CON= standard school program | I (body fat) | - increased fitness |
| Planet Health [58] | 1295 US children in 10 schools<br>11-12 yo | RCT cluster randomized by school - 91 weeks<br>(5 intervention vs. 5 control schools)<br>- program was a behavioural choice intervention concentrating on promotion of PA, modification of | I (BMI & skin folds in girls)<br>↔ (BMI in boys) | - intervention reduced TV hrs<br>- intervention increased fruit and veggie consumption in girls |

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| | | dietary I/T and reduction in sedentary behaviour | | |
| Eat Well and Keep Moving Program [59] | US chidren Grade 4-5 | Quasi-experimental field trial with 6 intervention vs. 8 matched control schools | Not measured | - total energy from fat and saturated fat were reduced among students in intervention<br>- TV viewing was marginally reduced |
| Crete Study [60, 61] | 962 Greek students from 40 schools<br>6 yo | CCT- 156 weeks<br>- health and nutrition components and a physical fitness and activity component | ↓ (BMI) | |
| KOPS [62] | 1640 German children (5-7 yo) | RCT-MC: 3 intervention school vs. 3 SE matched control (cross over from year to year)<br>CCT: family-based intervention + sports program offered to families with OW/OB kids or parents<br>- nutrition education & active breaks in school curriculum<br>- message was to eat fruit and veggies, keep active at least 1 hr/d, decrease TV viewing to less than 1 hr | ↔ (BMI @ 1 yr) | - @ 3 mos. knowledge and self-reported behaviours had improved in intervention schools |
| APPLES [63, 64] | 634 English children from 10 schools<br>(7-11 yo) | RCT cluster randomized by school- 1 yr<br>- multi-disciplinary targeting whole school including parents, teachers, nutrition staff<br>INTER= teacher training and resources, modification of school meals, support for PE and playground activities | ↔ (BMI @ 1 yr) | - higher reported consumption of veggies<br>- global self-worth higher in OB children in intervention group<br>- intervention successful in producing changes at the school level and children had higher scores for knowledge and attitudes |
| Pathways [65] | 1704 American Indian children (41 schools 8-11 yo) | RCT cluster randomized by school- 3 yrs<br>multi-component, multi-centre intervention for reducing body fat<br>INTER= i) change in dietary intake (food service was modified to reduce energy from fat), ii) increase PA (30 min 3-5/wk MVPA + exercise breaks in classroom), iii)<br>curriculum focused on health eating and lifestyle (2-45 min lessons/wk), iv) family involvement (take home packs with food ideas, family events at school including cooking & PA) | ↔ (BMI, skinfold or % BF) | - accelerometer data trend in right direction<br>- reduction in fat calories and self-report measures sign for dietary intake and PA<br>- knowledge was improved |
| Sallis [66] | 1484 children from 24 US middle schools<br>11-14 yo | RCT cluster randomized by school- 2 yrs<br>INTER= increase PA before, during after school. Reduced fat in school, student restaurants<br>CON= no special interventions | ↔ (BMI in girls)<br>↓ (BMI in boys) | - increase in PA in intervention group |

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| Eat Smart Play Smart Eat Smart + Play Smart [67] | 218 English children (5-7 yo) | RCT- 20 weeks of intervention<br>Children from 3 schools randomized to 4 conditions (3 intervention & 1 control taking place over lunchtime clubs)<br>- nutrition group<br>- PA group<br>- combined nut + PA<br>- control | ↔ (rate of OW/OB) | - significant changes in self-report knowledge and dietary I/T |
| Girls Health Enrichment Multi-site Study (GEMS)-Baylor [68] | 35 African American girls (8-10 yo) | RCT -12 weeks<br><br>INTER= 4-week summer day camp, followed by a special 8-week home Internet intervention for the girls and their parents.<br>CON= a different 4-week summer day camp, followed by a monthly home Internet intervention, neither of which components included the GEMS-FFFP enhancements | ↔ (BMI) | - less than half the treatment sample logged onto the Website |
| GEMS-Minnesota [69] | 54 African American girls (8-10 yo) | RCT- 12 weeks<br>INTER= after-school program conducted twice a week for 12 weeks focused on increasing physical activity and healthy eating. A family component was also included.<br>CON= a program over 12 weeks unrelated to nutrition and physical activity | ↔ (BMI) | |
| GEMS-Stanford [70] | 61 African American girls 8-10 yo | RCT- 12 weeks<br>INTER= after-school dance classes & a 5-lesson intervention, delivered in participants' homes, and designed to reduce television, videotape, and video game use.<br>CON= newsletters & health education lectures | ↔ (BMI) | - decreased TV viewing at dinner<br>- increased after-school physical activity |
| GEMS-Memphis [71] | 60 African American girls 8-10 yo | RCT- 12 weeks<br>INTER= highly interactive weekly group sessions with either girls (child-targeted program) or parents/caregivers (parent-targeted program). Content focused on knowledge and behavior change skills to promote healthy eating and increased physical activity.<br>CON= offered less comprehensive self-esteem enhancement | ↔ (BMI) | - reduced their consumption of sweetened beverages<br>- increased moderate-to-vigorous activity<br>- increased water consumption |
| Chilean Study [72] | 3086 children grades 1-8 from | CCT- 6 month intervention aimed to compare improved nutrition education and PA in elementary | ↓ (BMI & waist in boys) | - significant improvements in fitness |

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| | 5 schools | school children<br>- healthier food kiosks, 90 minutes of additional PA weekly, active recess | ↔ (BMI in girls) | |
| Healthy Start [73-75] | 827 preschoolers from 9 New York State Head Start centres<br>3-4 yo | CCT- 3 year intervention<br>INTER A= nutrition curriculum, family nutrition education, food service modification<br>INTER B= control curriculum, family education (safety), food modification<br>Control C= control curriculum (safety), family education (safety) | Not measured | - reduced fat and saturated fat content of preschool meals<br>- reduced children's consumption of saturated fat at preschool without compromising energy intake or intake of essential nutrients<br>- reduced serum cholesterol in the study population as a whole and specifically children 'at risk' |
| Take 10! [76] | 3 public school classrooms<br>grade 1, 3 & 5 | Convenience sample<br>-classroom-based physical activity prevention program integrating academic curriculum with MVPA | Not measured | - sessions for all three grades produced exercise levels in the moderate intensity range throughout full duration of the session |
| StEP TWO [77, 78] | 121 children from 7 German schools<br>aged 5-12 yo | Prospective CT: 3 intervention schools & 4 control<br>INTER=, stEP TWO program taught by nutritionists, psychologists, and MDs who cooked and ate with children 2x/wk using OPTIMIX diet + 60-90 min of PA<br>CON= step one health education and PA by regular teachers during school day | **ONGOING** | |
| Wellness, Academics & You (WAY) [79] | 1013 4th & 5th grade students from 69 classes in 4 states | CCT- by class at each school (1 year)<br>INTER=WAY: multidisciplinary 7 module system (orientation, health assessment tools, PA and fitness, nutrition, bodies and biology, genetics & family history, role playing and health advocacy) | ↔ (BMI) | - increases in fruit & veggie consumption and increase PA in intervention group |
| FitKid Project [80-82] | 18 elementary schools<br>3rd grade and follow until 5th grade | RCT- 3 yrs<br>- school based after school PA intervention offered 5 days/wk<br>INTER=fitogenic: academic enrichment, a healthy snack, PA in a mastery-oriented environment<br>CON= obesogenic environment | ↓ (relative reduction BF% @ 1 yr) | **ONGOING**<br>- YR 1: a greater relative gain in bone mineral density, and a greater relative reduction in heart rate response to the step test |
| Energizers [83] | N=243 students in the US<br>Gr. 3 & 4 assessed | 12-weeks of intervention<br>INTER= 10 min. energizers (short classroom based PA) provided 1X/day by teachers<br>CONT= no energizers | Not measured | - intervention group took significantly more steps in school<br>- energizers significantly improved on-task behaviour (8% improvement)<br>- least on-task students prior to intervention improved the most |

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| | | | | (20% improvement) |
| Dutch Obesity Intervention in Teenagers (NRG-DoiT)[84] | N= 20 schools in Amsterdam<br>12-13 yo | RCT- randomization by school (stratified- urban vs. rural)<br><br>INTER= reduction of consumption of sugar sweetened beverages, reduction of energy intake from snacks, decreased sedentary behaviour & increase PA (active transport and sport activity)<br><br>CON= regular curriculum | **- ONGOING** | |
| Hunter Illawarra Kids Challenge Using Parent Support (HIKCUPS)[85] | N= 205 families in Australia<br>5-9 yo | RCT by participant- 10 weeks of intervention & 24 months of follow-up/assessment<br><br>3 interventions:<br>INTER1=parent-centred dietary modification program<br>INTER2= child-centred PA skill-development program<br>INTER3= combination of 1& 2 | **- ONGOING** | |
| **DIET ONLY** | | | | |
| Chopps Study[86] | 574 British children<br>7-11 yo | Cluster RCT<br>- education based intervention<br>- discouraging carbonated beverages, encouraging fruit I/T and promoting water consumption | ↓ (% OW/OB) | - fewer carbonated drinks |
| School Nutrition Policy Initiative (SNPI) (Foster et al. NAASO 2006) | N=845 gr 4-6 in US<br>~11.1 yo | RCT by school- 2 years<br>50% of schools randomized to intervention vs. 50% controls<br>INTER=policy based: nutrition standards for school based food and drink, nutrition and education staff training, social marketing efforts to change behaviour<br>CON= no- treatment | ↔ (incidence of OB) | **ONGOING** |
| **TV VIEWING** | | | | |
| Robinson [21] | 198 US students<br>3rd & 4th grade<br>(~9yrs) | RCT cluster- by school (6 month intervention)<br>2 schools<br>INTER=18 lessons to reduce TV, videotape and video game use (30-50 min into standard curriculum)<br>CON= assessment only | ↓ (BMI, skin folds, waist) | - significant differences in TV viewing and meals eaten in front of TV<br>- no changes fat intake, MVPA or fitness |
| Switch-Play[87] | 293 Australian students from 3 schools<br>10 yo | RCT- by class<br>INTER 1= behavioural modification group (BM)- 19 sessions that encouraged them to reduce screen-based behaviours, and identified physical activity alternatives;<br>INTER 2= fundamental motor skills group (FMS)- 19 | BMI reported to be main outcome but data not reported | - > 1/2 the children reported reducing their TV viewing<br>- < 1/2 reported increasing their PA |

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| | | lessons that focused on mastery of six skills: run, throw, dodge, strike, vertical jump and kick<br>INTER 3= combined BM and FMS group<br>CON= usual classroom lessons | | |
| Dennison [88] | 176 US preschool and daycare children<br>3.6-5.5 yo | RCT cluster randomized by daycare –12 weeks<br>INTER= aimed to reduce TV viewing and encourage reading | ↔ (BMI) | - TV viewing dropped significantly |
| **COMMUNITY-BASED** | | | | |
| Ransdell [89] | 34 mother – daughter pairs (~15 yo) | RCT- 12 weeks<br>INTER= community-based (CB) or home-based (HB) program. CB participants attended three instructor-led sessions per week at a fitness facility within a university. HB participants were asked to participate in 3 sessions per week completed in or near the home. | Not measured | - daughters in both groups significantly improved their muscular endurance |
| Harvey-Berino [90] | 40 Native American moms & children<br>(9 mos – 3 yo) | RCT pilot- 16 weeks<br>INTER= home visiting parenting program focusing on developing appropriate diet and activity behaviour to prevent obesity | ↔ (maternal BMI or child weight for height) | - energy I/T decreased in the intervention group and increased in the control group |
| STRIP Study [91] | Finnish families<br>7 month old infants | RCT/CCT (8 yr follow-up)<br>- Intervention families received biannual individualized counseling focused on healthy diet and physical activity<br>re: cholesterol and saturated fat | I (prevalence of OW/OB) | |

RCT= randomized control trial, CCT= clinical controlled trial, INTER= intervention, CON= control, BMI= body mass index, BF=body fat, PA= physical activity, I = improvement, ↔ = no change

## 5.0 EVIDENCE SUMMARY OF THE EFFECTIVENESS AND IMPACT OF MULTI-LEVEL INTERVENTIONS, EDUCATION & AWARENESS, COMMUNITY MOBILIZATION* (see Appendix II for grading scale)

### 5.1 Prevention evidence summary: determinants of weight gain and weight maintenance ('energy balance') in children

**Evidence statements and grading**

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| **Weight outcomes** | | | |
| 1 | There is a body of evidence which suggests that the offspring of overweight and obese parent(s) are at increased risk of themselves becoming overweight or obese in childhood or adulthood | 2+ | Parsons et al. 1999[92] (2+) and Klesges et al. 1995[93] Reilly et al. 2005[94], Burke et al. 2005[95] (no significant association found in Thompson et al. 2004[96] and O'Loughlin et al. 2000[97]) |
| 2 | Cohort studies suggest that children who increase calorie intake, increase fat intake tend to gain weight<br><br>Also those who consume "junk food", "takeaways" and "carbonated drinks" and/or do not eat breakfast, tend to gain weight.<br><br>The evidence on 'snacking' is limited and inconsistent | 2+ | Moore et al. 2003[98], Klesges et al. 1995[93](2+), GUT study [99-101](2+) (O'Loughlin et al. 2000[97] [2+] and Bogaert et al. 2003[102] [2+] found no significant association with fat and calories), Burke et al. 2005[95] found inverse relationship between % energy from fat and BMI);<br><br>Reilly et al. 2005[94], Gillis et al. 2003 [103](junk food); Thompson et al 2004 [96], Burke et al. 2005[95], Gillis et al. 2003 [103](takeaways); Ludwig et al. 2001[104], Gillis et al. 2003[103, 104], Giammattei et al. 2003[105], Phiilips et al. 2004[106], RCT James et al.2004 [1++] [86], Welsh et al. 2005[107] (carbonated drinks);<br><br>Elgar et al. 2005[108] (snacking associated with obesity but did not predict change in BMI), Philips et al. 2004[106] found no significant relationship between BMI z-score or % body fat and total energy-dense snack consumption). |

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| 3 | There is limited evidence from prospective cohort studies over at least one year for the relationship between regular meals, portion size or snacking with weight in children | 2+ | McConahy et al. 2004[109] (portion size); Elgar et al. 2005[108] (skipping meals) |
| 4 | Cohort studies suggest that children who do not participate in sport outside school and who are the least active appear to gain more weight than their more active peers | 2+ | Burke et al. 2005[95], Elgar et al. 2005[108], Moore et al. 2003[98], O'Loughlin et al. 2000[97] (2+), GUT study[99, 101] (2+), Klesges et al. 1995[93] (2+), Datar et al. 2004[110] (2+) |
| 5 | The evidence from cohort studies is inconsistent on the associations between television viewing and weight gain. Some but not all identified studies found a significant association between greater television viewing and weight gain. However recent systematic review evidence indicates consistent improvement in weight indices when sedentary behaviours are targeted. | 1+ | Supportive: Viner et al. 2005[111], Burke et al. 2005[95], Elgar et al. 2005[108], Reilly et al. 2005[94], Moore et al. 2003[98], Kaur 2003 et al[112](2+), GUT study [99, 101] (2+)<br>Not supportive: Robinson et al.1993[113] (2+), Bogaert et al. 2003[102] (2+)<br>Inconsistent: O'Loughlin et al. 2000[97] (2+)<br>One systematic review (1+) by DeMattia et al. 2007 indicated that approaches to reduce sedentary behaviour (including TV time) improve weight indices. Virtually all interventions consistently resulted in slowing of the increase in the subjects' BMI relative to similar aged controls |

BMI, body mass index

## 5.2 Prevention evidence summary: interventions to raise awareness

**Evidence statements and grading**

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| **Weight outcomes** | | | |
| 1 | There is limited evidence to show that a multi-component intervention including a public health media campaign, can have a beneficial effect on weight management, particularly among individuals of higher social status | 2+ | Two 2+ (Wardle et al. 2001[114], Economos 2007 Shape up Somerville[19])<br>One 2– showing no effect but concerns about validity (Tudor-Smith et al. 1998[115]) |
| 2 | The effectiveness of promotional campaigns focusing on education alone remains unclear | 1+ | One RCT 1+ (O'Loughlin et al.[116]) in low-income, low-literacy volunteers in Canada suggest education alone ineffective |
| **Diet outcomes** | | | |
| 3 | There is a body of evidence that promotional campaigns including media interventions can increase awareness of what constitutes a healthy diet and may subsequently improve dietary intakes | 2+ | Five studies: O'Loughlin et al. 1998[116] (1+), Department of Health 2003[117] (2+), Wardle et al. 2001[114] (2+), Tudor-Smith et al. 1998, [115] (2–) Van Wechem 1997[118](2–) |
| 4 | There is a body of evidence that food promotion can have an effect on children's food preferences, purchase behaviour and consumption. The majority of food promotion focuses on foods high in fat, sugar and salt and therefore tends to have a negative effect. However, food promotion has the | 2+ | One systematic review 2+ (Hastings et al. 2003[119])<br>Harrison 2004 [22] (food advertisement directed at children) |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | potential to influence children in a positive way | | |
| **Physical activity outcomes** | | | |
| 5 | It remains unclear whether media interventions can influence participation in physical activity. There is some evidence that interventions may be more successful if they target motivated subgroups | 2++ | One systematic review of CBAs (Cavill and Bauman 2004[120] [2++]) plus one RCT (O'Loughlin 1998[116] [1+]), 2 BAs grade (2+) (Huhman et al. 2005,[121] Merom 2005 et al.[122]) and a BA grade 2– (Tudor-Smith et al. 1998[115])<br>ParticipACTION Canada (under development) |
| 6 | Promotional campaigns including media interventions can improve knowledge, attitudes and awareness of physical activity. Levels of awareness are likely to vary according to type of medium used and the scale of the campaign | 2++ | One systematic review of CBAs (Cavill and Bauman 2004[120] [2++]) plus one RCT (O'Loughlin 1998[116][1+]), two BAs (2+) (Huhman et al. 2005,[121] Merom 2005 et al.[122]) and a BA grade 2– (Tudor-Smith et al. 1998[115])<br>ParticipACTION Canada (underdevelopment), Ontario Ministry of Health Promotion: 'Not Gonna Kill You' |
| **Generalizability** | | | |
| 7 | There is a paucity of evidence in children and young people; the generalizability of evidence in adults to children and young people remains unclear | N/A | N/A |
| 8 | The effectiveness of interventions vary by age, gender, social status and ethnicity | 2+ | Wardle et al. 2001[114](2+), Hillsdon et al. 2001[123] (2+), Huhman 2005[121] (2+) |

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| **Implementation** | | | |
| 9 | Parents are important role models for children and young people in terms of behaviours associated with the maintenance of a healthy weight | 3 | One survey (McCullough 2004[124])<br>Review (Benton 2004 [30]) |
| 10 | Books, magazines and television programs are an important source of information and actively involving media providers may improve the effectiveness of interventions | 3 | One survey ('Family food survey' 2003[125]), one CBA (2+) (Wardle et al. 2001[114]) |
| 11 | A significant proportion of parents may not recognize that their child is overweight and may have a poor understanding of how to translate general advice into specific food choices | 3 | One survey (Jeffery 2005[126]) |

BA, before-and-after study; CBA, controlled before-and-after study; N/A, not applicable; RCT, randomized controlled trial

## 5.3 Prevention evidence summary: interventions for pre-school children and family-based interventions ('early years')

**Evidence statements and grading**

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| **Weight outcomes** | | | |
| 1 | There is limited evidence that interventions which focus on the prevention of obesity through improvements to diet and activity appear to have a small but important impact on body weight that may aid weight maintenance | 1+ | Five RCTs, three of which prevented gain (Fitzgibbon et al.[25–127] [Hip-Hop; 1+], He 2004[128] [1+], STRIP[129, 130] [1+]) and two found no difference between intervention and control (Healthy Start [75, 131] [2++], Dennison et al. 2004[88] [1+]) |
| 2 | Improvements in the food service to pre-school children can result in reductions in dietary intakes of fat and improved weight outcomes | 1+ | Body of evidence 1+: one systematic review (Worsley 2004[132]) |
| 3 | It remains unclear if a home-visiting program focused on changing lifestyle behaviors and improving parenting skills can reduce weight in preschool children. | N/A | Only one RCT [1-] family study was identified among children under 5 years (Native American population): no change in weight for height but decrease in energy intake (Harvey-Berino et al. 2003[90]) |
| 4 | Family-based interventions that target improved weight maintenance in children and adults, focusing on diet and activity, can be effective, at least for the duration of the intervention | 1++ | Body of evidence 1++: one systematic review (McLean et al. 2003[133][1++]) and one RCT (Hopper 1996[134] [1+]) |
| 5 | The effectiveness of interventions tends to be positively associated with the | 1++ | Body of evidence 1++: one systematic review (McLean et al. 2003[133]) |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | number of behaviour change techniques taught to both parents and children | | |
| 6 | It remains unclear whether the age of the child influences the effectiveness of family-based interventions compared with individual interventions | N/A | One study (Brownell et al. 1983[135]) in a systematic review (McLean et al. 2003[133] [1++]) suggested that more family interventions may be more effective in younger children |
| **Diet and activity outcomes** | | | |
| 7 | Interventions which do not identify favourable changes in weight outcomes may identify favourable changes in diet and/or activity outcomes (where recorded). | 1+ | Body of evidence, majority 1+: seven of the nine studies (Dennison et al. 2004[88] [1+], He 2004[128] [1+], Healthy Start [75, 131] [2++], Koblinsky et al. 1992[136] [2+], McGarvey et al. 2004[137] [2+], Reilly and McDowell 2003[138] [grade to be checked on publication of full study], Harvey-Berino et al. 2003[90] (1-), STRIP[129, 139] [1+]) reporting significant effects, concurrent with conclusions of systematic review (Worsley 2004[132] [1+]). One study showed mixed results (Hip-Hop[25, 127] [1+]) |
| 8 | There is some evidence that interventions which do not focus on preventing obesity, but aim to bring about modest changes in dietary and physical activity behaviour, are unlikely to demonstrate an impact on body weight. However, there is evidence from cohort studies that people who habitually eat healthy diets and are physically active are more likely to maintain their weight over the long term | 2+ | Healthy Start [75, 131] (2++) and Dennison et al. 2004[88] (1+)<br>(Although STRIP[129, 139] [1+] which aimed to improve cardiovascular disease showed positive results for weight for girls) |
| 9 | There is evidence for small but important beneficial effects of interventions that aim to improve dietary intake (such as videos, interactive demonstrations, and changing food | 2+ | Eight of the nine studies (Dennison et al. 2004[88] [1+], He 2004[128] [1+], Healthy Start [75, 131] [2++], Hip-Hop[25, 127] [1+], Koblinsky et al. 1992[136] [2+], McGarvey et al. 2004[137] [2+], Reilly and McDowell 2003[138] [1+], STRIP[129, 139] [1+])<br>One CBA on education alone showed no effect (Horodynski et al. 2004[140] [2–]) |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | provision at nursery school) so long as these interventions are not solely focused on nutrition education alone | | |
| 10 | The provision of regular meals in a supportive environment free from distractions may improve dietary intakes | 4 | Opinion statement from various sources |
| 11 | There is limited evidence that structured physical activity programs within nurseries can increase physical activity levels | awaiting final study results | One RCT: 1+ Reilly and McDowell 2003[138] (grade to be checked on publication of full study) |
| 12 | Interventions which involve parents in a significant way may be particularly effective and can improve parental engagement in active play with children and a child's dietary intake | 2+ | Body of evidence 2+<br>(majority of studies included parents but McGarvey et al. 2004[137] [2+] Koblinsky et al. 1992[136] [2+] ) specifically aimed at parents) |
| **Generalizability** | | | |
| 13 | The majority of interventions identified were conducted in the USA. However the findings are likely to be generalizable to the CAN population | 4 | Opinion statement |
| 14 | Interventions should be tailored as appropriate for lower-income groups | 1+ | Body of evidence 1+ and 2++: two RCTs (Dennison et al. 2004[88] [1+], Hip-Hop[127] [1+]) and one CCT (Healthy Start[75, 131] [2++]) |
| 15 | 2–5 years of age is a key time to establish good nutritional habits | 1+ | Body of evidence 1+: one systematic review (Worsley 2004 [132]) |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | especially when parents are involved. | | |
| **Implementation** | | | |
| 16 | Interventions require some involvement of parents or carers | 1+ | Body of evidence 1+: virtually all included RCTs involved parents |
| 17 | There is limited evidence that interventions to increase opportunities for children to be active can be incorporated into nurseries and implemented by nursery staff | awaiting final study results | One RCT 1+ Reilly and McDowell 2003[138] (grade to be checked on publication of full study) |

CBA, controlled before-and-after study; CCT, controlled clinical trial; N/A, not applicable; RCT, randomized controlled trial; STRIP,Turku Coronary Risk Factor Intervention Project for Children

## 5.4 Prevention evidence summary: school-based interventions

**Evidence statements and grading**

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| **Weight outcomes** | | | |
| 1 | The evidence on the effectiveness of multi-component school-based interventions to prevent obesity (addressing the promotion of physical activity, modification of dietary intake and reduction of sedentary behaviours) is equivocal. Some identified interventions demonstrated a reduction in mean BMI and the prevalence of obesity while the intervention was in place, but this finding was not universal.<br><br>Systematic review evidence suggests that school-based interventions are generally too short term and thus not effective.<br><br>CAN-based evidence in particular is lacking | 1++ - 2+ | Four studies, two 1+ RCTs (Sallis et al. 2003[66] [boys; girls NS], Gortmaker et al. 1999[58][girls; boys NS]) and two 2+ CCTs (Graf et al. 2005,[77] Kain et al. 2004[72] [boys; girls NS])<br><br>Nine did not show significant improvements in weight/BMI (Vandongen et al. 1995[53] [1 ], Howard et al. 1996[54] [ 1 ] Warren et al. 2003 [67] [1+], Sahota et al. 2001[64]}[1+], Caballero et al. 2003[65] [1+], Donnelly et al. 1996[55] [2+], Neumark-Sztainer et al.2003 [141] [2+], Story et al. 2003[69][1+], Muller et al. 2001[62] [1+])<br><br>KISS- ongoing<br><br>FitKid- ongoing<br><br>NRG-DoiT- ongoing<br><br>One systematic review: Summerbell et al. 2005 [14] (1++) suggests that many diet and exercise interventions to prevent obesity in children are not effective in preventing weight gain |
| 2 | School-based physical activity interventions (physical activity promotion and reduced television viewing) may help children maintain a healthy weight but more have shown no improvement in body composition variables | 1+ | Flores 1995[40] improvement in girls only (1+), Robinson 1999[21] and two CCT (2+) (Stephens 1998[41], Alexandrov 1992[38])<br><br>Eight physical activity studies did not show improvement in weight (Bush et al. 1989[51] [1+], Hansen et al, 1991[37][1+], Pate et al. 2005[142] [1+], Schofield et al. 2005[143] [2+], Jamner et al. 2004[47] [2+], Sallis et al. 1993/7 [39, 144][1+], Pangrazi et al. 2003[45] [2+], Trudeau et al. 2000/1[145, 146] [2–])<br><br>One showed trends in improvement with age in BMI in girls (Mo-suwan et al. 1998 [42] [1+]) |
| 3 | There is evidence to suggest that interventions to reduce consumption of | 1++ | One 1++ RCT (James et al. 2004[86]) |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | carbonated drinks containing sugar may have a role in reducing the prevalence of overweight and obesity | | Ludwig et al. 2001[103, 104], Gillis et al.[103, 104], Giammattei et al. 2003[105], Welsh et al. 2005[107] |
| **Diet and activity outcomes** | | | |
| 4 | There is a body of evidence that school-based multi-component interventions addressing various aspects of diet and/or activity in the school, including the school environment are effective in improving physical activity and dietary behaviour, at least while the intervention is in place. However, CAN-based evidence to support multi-component interventions (the 'whole-school approach') is limited | 1+ | Eight studies 1+: Simon et al. 2004,[147]Pate et al. 2005, [142] Caballero et al. 2003,[65] Leupker et al. 1996,[56] Trevino et al. 2004/5,[148, 149], Sahota et al. 2001,[64] Warren et al. 2003,[67] Vandongen et al. 1995 [53]<br>Four studies 2+: Donnelly et al. 1996, [55] Manios 1998/99/2002,[61, 150]Anderson 2000 from Woolfe and Stockley 2005 review[151](2+) |
| 5 | There is a body of evidence to suggest that short- and long-term school-based interventions to improve children's dietary intake may be effective, at least while the intervention is in place. This includes interventions aiming to increase fruit and (and to a lesser extent) vegetable intake, improve school lunches and/or promote water consumption | 1+ | Two non-systematic reviews (French and Wechsler 2004[152][2+], Woolfe and Stockley 2005[151] [2+])<br>Ten RCTs 1+: James et al. 2004. [86] Perry et al. 2004,[153] Caballero et al. 2003,[65] Sallis et al. 2003,[66] Sahota et al. 2001,[64] Warren et al. 2003,[67] Leupker et al. 1996,[56] Vandongen et al. 1995, [53] Gortmaker et al. 1999,[58] Trevino 2004/5 et al. [148, 149]<br>Four studies 2+: Bere et al. 2005,[154] Loughridge and Barratt 2005,[155] Donnelly et al. 1996,[55] Manios et al. 1998, 1999, 2002[61, 150, 156]<br>One study 2–: Horne et al. 2004[157] |
| 6 | Evidence suggests that school children with the lowest fruit and vegetable intakes at baseline may benefit more from the school-based interventions than their peers | 2+ | Bere et al. 2005[154] (2+), Horne et al. 2004[157] (2–), Woolfe and Stockely 2005 review[151] (2+) |
| 7 | There is evidence from multi-component | 1+ | Six multi-component studies supportive |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | interventions to suggest that both short- and long-term physical activity focused interventions may be effective, at least while the intervention is in place | | Five studies 1+: Simon et al. 2004, [147] Pate et al. 2005, [142] Caballero et al. 2003,[65] Leupker et al. 1996, [56] Trevino et al. 2004/5[148, 149]<br>One study 2+: Manios et al. 1998/9/2002[61, 150, 156] |
| **Other outcomes** | | | |
| 8 | No negative outcomes were reported in the identified studies. One multi-component study showed that measures of extreme dieting behaviour remained unchanged | 1+ | Two papers (both 1+) from one study: Gortmaker et al. 1999[58] and Austin et al. 2005[158] |
| **Generalizability** | | | |
| 9 | Little of the evidence for school-based interventions is CAN based. However, it is likely that the findings are generalizable to CAN | 4 | Opinion statement |
| **Implementation** | | | |
| 10 | There is limited evidence to indicate that in terms of engaging schools it is important to enlist the support of key school staff | 2+ | One paper (Anderson 2000, (2+) included in review by Woolfe and Stockley 2005[151](2+) |
| 11 | There is a body of evidence to suggest that young people's views of barriers and facilitators to healthy eating indicated that effective interventions would (i) make healthy food choices accessible, convenient and cheap in schools, (ii) involve family and peers, and (iii) address personal barriers to healthy eating, such as preferences for fast food in terms of | 1++ | EPPI-centre [159, 160] |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | taste, and perceived lack of will-power | | |
| 12 | There is a body of evidence to suggest that young people's views on barriers and facilitators suggest that interventions should (i) modify physical education lessons to suit their preferences, (ii) involve family and peers, and make physical activity a social activity, (iii) increase young people's confidence, knowledge and motivation relating to physical activity, and (iv) make physical activities more accessible, affordable and appealing to young people | 1++ | EPPI-centre [161, 162] |

BMI, body mass index; CCT, controlled clinical trial; NS, not significant; RCT, randomized controlled trial; EPPI, Evidence for Policy and Practice Information and Co-ordinating Centre

## 5.5 Prevention evidence summary: interventions led by health professionals ('Community 1')

**Evidence statements and grading**

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| **Weight outcomes** | | | |
| 1 | Sustained health-professional-led interventions in primary care or community settings, focusing on diet and physical activity or general health counselling can support maintenance of a healthy weight | 1+ | Body of evidence variable but generally supportive<br>One systematic review and eight RCTs mostly 1+<br>Systematic review supports: Asikainen et al. 2004[163] (1++)<br>Three RCTs support: Simkin-Silverman et al.2003[164] (1++), ICRF 1995[165] (1+), Murray and Kurth1990[166] (1++)<br>Three RCTs show trend: Fries et al. 1993[167] (1+), Jeffery 1999[168] (1+), FHSG 1994[169](1+)<br>Two RCTs do not support: Dzator et al. 2004[170] (1+), ICRF 1994[165] (1+) |
| 2 | Interventions which provide support and advice on physical activity and diet are more likely to be effective for weight outcomes than interventions which focus on physical activity alone. There is no reliable evidence for diet alone | 1+ | Body of evidence variable for physical activity alone: 11 RCTs<br>One shows weight reduction (self-reported): Stewart et al. 2001[171] (1+)<br>Five show trend and/or changes in body composition: Taylor et al. 1998[172] (1+), Schmitz et al. 2003[173] (1+), Coleman et al. 1999[174] (1+), Dunn et al. 1999[175](1+), Elley et al. 2003[176] (1++)<br>Five do not support: Hillsdon 2002[177] (1+), Pereira et al. 1998[178] (1+), Tully et al. 2005[179](1+), Lamb et al. 2002[180] (1+), Halbert et al. 2000[180, 181] (1++)<br>Limited evidence for diet alone: one RCT and one CBA<br>CBA supports: Wrieden et al. 2002[182] (2+); RCT does not support: John et al. 2002[183] (1++) |
| **Diet and activity outcomes** | | | |
| 3 | Interventions which do not identify favourable changes in weight outcomes may identify favourable changes in diet | 1+ | At least four RCTs: Dzator et al. 2004[170] (1+) and John et al. 2002[183] (1++) for diet; Pereira et al. 1998[178] (1+) and Elley et al. 2003[176] (1++) for physical activity |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | and/or activity outcomes (where recorded). | | |
| 4 | Behavioural/educational interventions to increase physical activity can be moderately effective, particularly for walking and non-facility-based activities, although increases may not be sustained over time | 1++ | Body of evidence variable but largely supportive<br>Four systematic reviews and 12 RCTs (1++/1+)<br>Systematic reviews had variable results with some support: Hillsdon and Thorogood 1996[184] (1++), Eden et al. 2002[185] (1++), Eakin et al. 2000[186](1++), Morgan 2005[187] (1+)<br>Nine of 13 more recent and/or RCTs support: Dzator et al. 2004[170] 1+, Simkin-Silverman et al. 2003[164] (1++), Stewart et al. 2001[171] (1+), Coleman et al. 1999[174] (1+), Dunn et al. 1999[175] (1+), Pereira et al. 1998[178] (1+), Harland et al. 1999[188] (1++), Stevens et al. 1998[189] (1+), Elley et al. 2003[176] (1++)<br>One RCT suggests positive trend: Hillsdon 2002[177] (1+)<br>Three RCTs do not support: Jeffery 1999[168] (1+), Lamb et al. 2002[180] (1+), Schmitz et al. 2003[173] (1+)<br>One systematic review (3) noting high attrition in exercise referral studies: Gidlow et al. 2005[190]–(Please note that this review is treated as a review of observational studies, hence grading) |
| 5 | Limited evidence suggests that using an incentive of free access to leisure facilities is likely to increase activity levels but only during the period of the intervention | 1+ | One RCT: Harland et al. 1999[188] (1++) |
| 6 | Moderate- or high-intensity dietary interventions most commonly report clinically significant reductions in fat intake and an increase in fruit and vegetable intake | 1++ | Body of evidence supportive: one systematic review, four RCTs and two CBAs<br>Systematic review: Pignone et al. 2003[191] (1++)<br>RCTs: Carpenter and Finley 2004[192] (1++), Havas et al. 2003[193] (1+), Dzator et al. 2004[170] (1+), Havas et al. 1998[194] (1+)<br>UK CBAs: Department of Health 2003[117] (2+),Wrieden et al. 2002[182] (2+) |

| | | | |
|---|---|---|---|
| 7 | Briefer interventions, such as brief counselling/dietary advice by GPs or other health professionals, can be effective in improving dietary intake but tend to result in smaller changes than intensive interventions | 1++ | Body of evidence: two systematic reviews and four RCTs (1++/1+)<br>Systematic reviews: Pignone et al. 2003[191] (1++), Ashenden et al. 1997[195] (1+)<br>RCTs: Delichatsios et al. 2001[196] (1+), Steptoe et al. 2003[197] (1++), John et al. 2002[183] (1++), Beresford 1997[198] (1+) |
| 8 | Interventions with a greater number of components are more likely to be effective | 1++ | Body of evidence (1++): one systematic review (Pignone et al. 2003[191]) |
| **Generalizability** | | | |
| 9 | The majority of interventions identified were conducted in the USA. However, the findings are likely to be generalizable to the CAN population | N/A | Opinion based on full range of evidence |
| 10 | Although the majority of studies included predominantly white, higher social status and reasonably motivated individuals, there is some evidence that interventions can also be effective among lower social groups and effectiveness does not vary by age or gender | 1+ | Body of evidence supportive for lower social groups (four RCTs and one CBA) and for age/gender (only one study, a survey, suggested variable effect in men and women)<br>*Lower social groups*: three RCTs (Steptoe et al. 2003[197] [1++], Havas et al. 1998[194] [1+], Havas et al. 2003[193] [1+]); one CBA (Wrieden et al. 2002[182] [2+])<br>*Age/gender*: only one study suggested potential variation in effect a survey (Duaso and Cheung 2002[199] [3]) |
| **Implementation** | | | |
| 11 | Tailoring dietary advice to address potential barriers (taste, cost, availability, views of family members, time) is key to the effectiveness of interventions and may be more important than the setting | 3 | Body of survey and qualitative evidence in four RCTs and one CBA support (all grade 3)<br>Four surveys/qualitative studies in RCTs: Anderson et al. 1998,[200] Lloyd et al. 1995,[201] John and Ziebland 2004,[202] Baron et al. 1990[203]<br>One qualitative study in a CBA: Wrieden et al. 2002[182] |

| | | | |
|---|---|---|---|
| 12 | The type of health professional who provides the advice is not critical as long as they have the appropriate training and experience, are enthusiastic and able to motivate, and are able to provide long-term support | 3 | Two qualitative studies and one evaluation of case studies support (all grade 3)<br>Qualitative studies: Hardcastle and Taylor 2001,[204] Fuller et al. 2003[205]<br>Evaluation of case studies: Biddle et al. 1994[206] |
| 13 | It remains unclear whether interventions are more effective when delivered by multidisciplinary teams | N/A | Two RCTs (Elley et al. 2003[176] [1++], Lamb et al. 2002[180] [1+]) noted no significant effect on weight when two professions combined vs one; RCT with single professional suggesting weight gain (Halbert et al. 2000[181] [1++]) |
| 14 | There is some evidence that primary care staff may hold negative views on the ability of patients to change behaviours, and their own ability to encourage change | 3 | Three qualitative studies and one survey/case study support (all grade 3)<br>Qualitative studies: Fuller et al. 2003[205], Coggans et al. 2000[207], Benson and Cribb 1995[208]<br>Case study/survey: Hopper and Barker 1995[209] |
| 15 | There is a body of evidence from qualitative research that time, space, training, costs and concerns about damaging relationships with patients may be barriers to action by health professionals (GPs and pharmacists) | 3 | Six qualitative studies, one cross-sectional study and one survey/case study support (all grade 3)<br>Qualitative: Fuller et al. 2003,[205] Smith et al. 1996,[210] Keene and Cervetto 1995,[211] Ursell et al. 1999,[212] Moore et al. 1995,[213] Coggans et al. 2000, [207] Benson and Cribb 1995 [208]<br>Cross-sectional: Vernon and Brewin 1998[214]<br>Survey/case study: Hopper and Barker 1995[209] |
| 16 | There is some evidence that patients are likely to welcome the provision of advice despite concerns by health professionals about interference or damaging the relationship with patients | 3 | One qualitative (Duaso and Cheung 2002[199] and one case study (Hardcastle and Taylor 2001[204]) support |

| | | | |
|---|---|---|---|
| 17 | Tailoring physical activity advice to address potential barriers (such as lack of time, access to leisure facilities, need for social support and lack of self-belief) is key to the effectiveness of interventions | 1++ | Body of evidence from two reviews and corroborative evidence supports<br>One systematic review noting attrition through problems with attendance at leisure facilities: Gidlow et al. 2005[190] (3++)<br>One systematic review noting importance of self-belief: Keller et al. 1999[215] (3++)<br>Three qualitative studies and three surveys also support (all 3)<br>Qualitative: Hardcastle and Taylor 2001, [204] Martin and Wollf-May 1999,[216] Ashley et al. 2000[217]<br>Survey: See Tai et al. 1999,[218] Vernon and Brewin 1998, [214] Horsefall/Wealden District Council 1997[219] |

CBA, controlled before-and-after study; FHSG, Family Heart Study Group; GP, general practitioner; ICRF, Imperial Cancer Research Fund; N/A, not applicable; RCT, randomized controlled trial

## 5.6 Prevention evidence summary: broader community interventions ('Community 2')

**Evidence statements and grading**

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| **Weight outcomes** | | | |
| 1 | There is evidence from 4 community-based interventions on the effectiveness of broader environmental interventions on the maintenance of a healthy weight and prevention of obesity | 2+ | Four BA studies Shape up Sommerville, French Fleurbaix-Laventie program, Ensemble Prévenons l'Obesité Des Enfants, Be Active Eat Well |
| **Diet and activity outcomes** | | | |
| 2 | There were 4 programs identified which addressed both diet and activity and showed that large-scale community wide efforts can make a difference (albeit modest) | 2+ | Shape up Sommerville [19]<br>French Fleurbaix-Laventie program<br>Ensemble Prévenons l'Obesité Des Enfants<br>Be Active Eat Well |
| 3 | There is little evidence of benefit from locally implementable city- and province-wide interventions to prevent cardiovascular disease in relation to diet and/or physical activity outcomes. | 2+ | Four CBAs (all 2+) generally do not support. Baxter et al.1997[220]supports diet change in one area<br>No support for dietary change from Huot 2004,[221] O'Loughlin et al. 1999,[222] Osler and Jespersen 1993[223]<br>No support for physical activity change from O'Loughlin et al 1999,[222] Baxter et al. 1997,[220]Osler and Jespersen 1993[223] |
| 4 | Point of purchase schemes in shops, supermarkets, restaurants and cafes can be effective in improving dietary intakes at least in the short term, particularly if accompanied by | 2++ | Body of evidence variable but generally supportive from four systematic reviews of non-randomised studies and three RCTs<br>Systematic reviews support: Roe et al. 1997[224] (1++), Seymour et al. 2004[225] (2++), Matson-Koffman et al. 2005[226] (2+), Holdsworth and Haslam 1998[227] (2+) |

| No. | Statement | Grade | Evidence |
|---|---|---|---|
| | supporting education, information and promotion. There is some evidence that longer-term, multi-component interventions may show greater effects | | One RCT suggests trend: Kristal 1997 [228] (1+)<br>One RCT suggests low-fat alternative acceptable: Stubenitsky et al. 2000[229] (1+)<br>One RCT does not support: Steenhuis et al. 2004[230] (1+) |
| 5 | There is a body of evidence that creation of, or enhanced access to space for physical activity (such as walking or cycling routes), combined with supportive information/promotion, is effective in increasing physical activity levels | 2++ | Body of evidence generally supports. One systematic review and three additional studies (all 2++/2+)<br>One systematic review (Kahn et al. 2002[231] [2++]) and one BA (Merom et al. 2003[232] [2+]) support<br>One CBA (Brownson 2004[233] [2+]) shows trend.<br>One BA (Evenson et al. 2005[234] [2+]) does not support |
| 6 | The general promotion of active travel (for example, publicity campaigns) does not appear to be effective in increasing physical activity levels | 1++ | Body of evidence from one systematic review supports: Ogilvie et al. 2004[235] (1++) |
| 7 | Targeted behavioural change programs with tailored advice appear to change travel behaviour of motivated groups. Associated actions such as subsidies for commuters may also be effective | 1++ | Body of evidence from one systematic review supports: Ogilvie et al. 2004[235] (1++) |
| 8 | Point of decision prompts or educational materials such as posters and banners have a weak positive effect on stair walking | 2+ | Body of evidence from two systematic reviews and two BA studies generally suggest weak positive and/or short-term effect<br>Systematic reviews (Foster and Hillsdon 2004[236] [2+], Kahn et al. 2002[231] [2++]) and two BA studies (Marshall et al. 2002[237] support<br>One BA study (Adams and White 2002[238] [2+]) does not support |

| | | | |
|---|---|---|---|
| **Generalizability** | | | |
| 9 | Barriers may vary by age, gender and social status | 3 | Body of evidence from 10 observational studies supportive (all 3)<br>*Age:* Whelan et al. 2002[239] (qualitative), Holdsworth et al. 1997[240] (cross-sectional), Watt and Sheiham 1996[241] (cross-sectional), Watt and Sheiham 1997[242] (qualitative), Mulvihill et al. 2000[243] (qualitative), Davis et al. 1996[244](qualitative)<br>*Gender:* Foster et al. 2004[245] (cross-sectional), Coakley et al. 1998[246] (qualitative), Mulvihill et al. 2000[243] (qualitative)<br>*Social status:* Coakley et al. 1998[246](qualitative), Watt and Sheiham 1996[241] (cross-sectional), Furey et al. 2001[247](qualitative /quantitative), Caraher et al. 1998[248] (cross-sectional), Whelan et al. 2002[239] (qualitative) |
| **Implementation** | | | |
| 10 | Auditing the needs of all local users can help engage all potential local partners and establish local ownership | 3 | Three sets of case studies support (all grade 3):<br>Sustrans 2004,[249] Department for Transport 2003,[250] McGuigan 1999 [251] |
| 11 | Interventions may be ineffective unless fundamental issues are addressed, such as individual confidence to change behaviour, cost and availability; pre-existing concerns such as poorer taste of healthier foods and confusion over mixed messages; the perceived 'irrelevance' of healthier eating to young people; and the potential risks (including perception of risk) associated with walking and cycling | 3 | Body of evidence from 14 corroborative studies support (majority 3)<br>*Dietary change*: Wrigley et al. 2003[252] (BA; 2+), Whelan et al. 2002[239] (qualitative), White et al. 2004[253](cross-sectional), Knox et al. 2001[254] (qualitative), Dibsdall et al. 2002[255] (qualitative)<br>*Physical activity:* Cole-Hamilton et al. 2002[256] (systematic review), Derek Halden Consultancy 1999, [251] Dixey 1999[257] and 1998[258] (survey/interviews), DiGuiseppi 1998[259] (cross-sectional), Coakley et al. 1998[246] (qualitative), Jones 2001[260] (BA/survey; 2+), Hillman 1993[261] (cross-sectional) |
| 12 | Addressing safety concerns in relation to walking and cycling may be particularly important for females and | 3 | Four corroborative studies support: Foster et al. 2004[245] (cross-sectional), Coakley et al. 1998[246] (qualitative), Mulvihill et al. 2002[243] (qualitative), Davis and Jones 1996[244] (qualitative). |

| | | | |
|---|---|---|---|
| | children and young people and their parents | | |
| 13 | Interventions which incorporate novel educational and promotional methods, such as videos and computer programs, may improve dietary intake | 1++ | Three RCTs support: Winett et al. 1988, Winett et al. 1991 (both cited in Roe et al. 1997[224][1++]), Anderson et al. 2001[262] (1+) |
| 14 | Changes to city-wide transport, which make it easier and safer to walk, cycle and use public transport have the potential to make active transport more appealing to local users | 3 | Four corroborative studies support:<br>Transport for London 2005[263] (case study/audit 3); Department of Transport 2000[264] (case studies 3), Parker and Seddon 2003[265] (BAs; 2+), Jones 2001[260] (BA/survey; 2+) |

BA, before-and-after study; CBA, controlled before-and-after study; N/A, not applicable; RCT, randomized controlled trial

## 6.0 RECOMMENDATIONS

Given the epidemic nature of the childhood obesity issue, many organizations world-wide have been working towards childhood obesity prevention strategies and recommendations and, as a result they are based on many already in existence (European Heart Network, Institute of Medicine, Ontario Medical Association, Registered Nurses Association of Ontario, American Academy of Pediatrics, Canadian Obesity Network, NICE).

Most importantly, the Champlain Healthy School-aged Children (CHSAC) group must address all aspects of the obesogenic environment through modifications in healthy active living practices in schools, communities and the built environment and this may include legislated policy change.

### 6.1 General

- ✓ Implementation of long-term initiatives that include long-term follow up is a necessity in order to determine the sustainability of program impacts as it relates to maintenance of normal body weight. Short-term interventions provide little information on sustainability and continuing impact on OB prevalence and co-morbidities.
- ✓ Environmental modifications are necessary and must focus on creating supportive environments to overcome 'obesogenic elements'.
- ✓ Inclusion of a home-based piece including involvement of parents/caregivers is a must.
- ✓ Attention needs to be paid to stakeholder involvement in program development and integrity.
- ✓ The outcomes of interest should not focus solely on weight/body composition as we want to encourage behaviour change - obesity is not addressed for esthetic reasons but for prevention of obesity related co-morbidities. It is also important to measure psychological well-being.
- ✓ CHSAC group should develop a system of tracking the effectiveness of strategies and policies.

### 6.2 Specific

#### 6.2.1 School / Curriculum

**Pre-school**

The CHSAC group should ensure that all nurseries and childcare facilities are aware that preventing excess weight gain and improving children's diet and activity levels are priorities. Ensure young children in day care settings (either home or group settings) have:

- Healthy food choices;
- Daily physical activity;
- Opportunities to learn about the benefits of healthy eating and physical activity; and,
- Day care providers who are trained and knowledgeable about healthy eating and daily physical activity.

**School-aged Children**

The school setting is pivotal for the promotion of healthy active living and school-based prevention programs to reduce the risk of childhood obesity and the CHSAC group should:

- Ensure that all Champlain region schools have prioritized improving the diet and activity levels of children and young people and that action is being taken through the school curriculum to help prevent excess weight gain. A whole-school approach should be used to develop life-long healthy eating and physical activity practices;
- Aid teachers and administrators, in collaboration with parents and students, in assessing the whole-school environment to ensure that the ethos of all school policies helps children and young people to maintain a healthy weight, eat a healthy diet and be physically active, in line with existing standards and guidance. This includes policies relating to building layout and recreational spaces, catering (including vending machines) and the food and drink children bring into school, the taught curriculum (including PE), school travel plans and provision for cycling, and policies relating to the healthy school programs;
- Ensure that Champlain region school boards have strategies in place certifying that teaching, support and catering staff receive training on the importance of healthy school policies and how to support their implementation;
- Ensure that controls on the provision and sale of high-fat snacks, confectionery and sweet drinks are seen as a necessity in schools and that restrictions should continue to be placed on access to nutrient-poor foods to children without caregiver supervision and while under care of school boards;
- Ensure that children and young people are able to eat meals (including packed lunches) in school in a pleasant, sociable environment. Younger children should be supervised at mealtimes and, if possible, staff should eat with children;
- Help schools establish links with relevant organizations and professionals, including health professionals and those involved in local strategies and partnerships, to promote sports for children and young people;
- Assist with the development of sustainable multi-component interventions that address the whole school, including after-school clubs and other activities. Short-term interventions and one-time events are insufficient on their own and should be part of a long-term integrated program; and,
- Make certain that staff delivering physical education, sport and physical activity promote activities that children and young people find enjoyable and can take part in outside school, through into adulthood. Children's confidence and understanding of why they need to continue physical activity throughout life (physical literacy) should be developed as early as possible.

### 6.2.2 Community

**Forge Strategic Partnerships**

- To achieve broad and sustained progress, stakeholders and decision-makers from important arenas will collectively need to take the initiative, collaborate more closely with the common goal

of promoting the health of students, and forge partnerships among private industry, non-profit groups, healthcare providers and municipal governments. City planners, community developers and school board officials all have a role to play in childhood obesity and a responsibility to work together to alleviate the burden.

- All community programs to prevent obesity, increase activity levels and improve diet (including reducing energy intake) should address the concerns of local people from the outset. Concerns might include the availability of services and the cost of changing behaviour, the expectation that healthier foods do not taste as good, dangers associated with walking and cycling, and confusion over mixed messages in the media about weight, diet and activity.
- Health professionals should work with food stores, supermarkets, restaurants, cafes and voluntary community services to promote healthy eating choices that are consistent with existing good practice guidance and to provide supporting information.
- Identify people in leadership positions – elected officials, media personalities or sports figures – to act as role models.

**Built Environment**

Recognizing that the built environment plays a key role in the proliferation of our obesogenic culture, the CHSAC group must make attempts to influence this factor so that healthier choices are more available, easier to access, and widely promoted to the community.

- Community planning policies and processes should be examined to identify how local communities can promote PA, reduce barriers to PA for everyone (i.e. independent of SES), and engage young people in PA. Local government, private developers and community groups should expand opportunities for PA, including recreation facilities, parks, playgrounds, sidewalks, bike paths, routes for walking or cycling to school, and safe streets and neighbourhoods.
- Education and training should be provided for community planners, engineers, architects and decision makers in “active living by design”. Communities should prioritize capital improvement projects to increase opportunities for PA by improving the street, sidewalk and street-crossing safety routes to school, develop programs to encourage walking and cycling to school, and build schools within walking distance of the neighbourhoods they serve.
- When building or retrofitting schools, features should be included that support physical activity and healthy eating, such as:
    - Bicycle racks;
    - Active and safe routes to schools;
    - Adequate, separate indoor facilities to support quality daily physical activity;
    - Kitchen facilities; and,
    - Adequate space for students to eat lunch.

### 6.2.3 Empower Local Schools & Communities

Given that each community and school is contextually unique, there is no one-size-fits-all program that can be effectively implemented. We must help communities identify issues that are important and relevant, and enable them to develop strategies to address them. The CHSAC group should:

- Develop a community health index 'toolkit' through government / academic / community partnerships to assist in examining factors relevant to creating healthy communities;
- Compile and widely share community-based evaluation results, lessons learned and community action plans;
- Empower schools to bolster PE and PA requirements, standards and efforts in pre-school, child-care and after school programs;
- Lobby to ensure schools are provided with adequate sustained resources through provincial government funding to implement relevant changes in the school environment to increase PA and the availability and consumption of foods and beverages that support a healthful diet;
- Organize specific physical activity events or include physical activity opportunities at existing community events. Serve healthy food choices at these events; and,
- Encourage and support the integration of healthy eating and physical activity opportunities into new and existing community programs such as prenatal classes, pre-schools/day care and after school programs.

### 6.2.4 Media / Industry

The CHSAC group should:

- Facilitate the development of a media-related campaign to promote healthy choices and portion sizes for children and youth;
- Advocate for controls being placed on the advertising and promotion of food and drink products in schools; and,
- Advocate for legislation to be put in place that restrict advertising of obesogenic foods to children in the media.

### 6.2.5 Advocacy / Policy / Government

Reversing the rise in childhood obesity will require a concerted effort and sustained commitment from governments (municipal/provincial/federal) to support policies and programs that match the scope of the problem. Prevention of obesity in children **IS** a public health priority and thus the CHSAC group should:

- Advocate local government to ensure that they demonstrate leadership for childhood obesity prevention by committing adequate resources and developing policies that lead to changes supporting a healthy school environment and healthy communities. This may include support for increased support to public health agencies and community coalitions in their collaborative efforts to promote and evaluate obesity prevention efforts;
- Explore policy options to control food advertising targeting children similar to those now in place in Quebec where advertising of some products to children under 13 is prohibited (a number of European countries have introduced legislation to ban advertising aimed at children);
- Advocate for public subsidies on healthy foods to improve patterns of food consumption and for economic incentives to use public transportation;

- Investigate the potential impact of food pricing options on consumption patterns, especially for communities where healthy foods, such as fruits and vegetables, are particularly expensive; and,
- Develop policies and programs that promote healthy eating through the use of child-friendly mandatory nutritional information labeling for all processed food (for example, using energy density traffic light system).

### 6.2.6 Educate Stakeholders

- Obesity – and implementing the following recommendations – should be an ongoing priority and clearly identified as such by local strategic partnerships, public health agencies, schools, communities as well as front-line health care practitioners.
- Improve training for health professionals in obesity prevention, diagnosis, and counseling of those at risk for obesity.
- Improve health education to enable citizens to make informed choices.
- All actions aimed at preventing excess weight gain and improving diet (including reducing energy intake) and activity levels in children and young people should actively involve parents and caregivers.
- Families should assess the home environment to ensure that foods and beverages supporting a healthful diet are consumed by children and youth at home and served in reasonable portion sizes.
- Families should emphasize PA as a family priority and establish rules/guidelines that limit leisure screen time (TV, DVD, videos, movies, games and computers) to < 2 h per day.

### 6.2.7 Evaluate Obesity Prevention Efforts & Document the Benefits of Obesity Prevention

- Champlain region pediatricians, family physicians, nurses, and other clinicians should engage in the prevention of childhood obesity.
- These professionals should routinely track BMI, offer relevant evidence-based counseling and guidance, serve as role models, and provide leadership in their communities for obesity prevention efforts.
- Training programs and certifying entities should require obesity prevention knowledge and skills in their curricula and examinations.
- All primary care settings should ensure that systems are in place to implement the local obesity strategy. This should enable health professionals with specific training, including public health practitioners working singly and as part of multidisciplinary teams, to provide interventions to prevent and manage obesity.

## 7.0 CONSIDERATIONS FOR DESIGN OF INTERVENTION PROGRAM

**Efficacy** – will it have an impact on obesity?

**Cost** – is it worth paying this?

**Reach** – will enough children be affected?

**Inequalities** – does it help low-income families?

**Sustainability** – will it last?

**Side effects** – are there social benefits?

**Acceptance** – will it be popular?

**Feasibility** – can it be implemented?

### Develop long-term strategic plan

- Government, industry, communities, schools, and families should demonstrate leadership and commitment by mobilizing the resources required to identify, implement, evaluate, and disseminate effective policies and interventions that support childhood obesity prevention programs.
- Many of the issues involved in preventing childhood obesity – including actions on street and neighbourhood design, plans for parks and community recreation facilities, and locations of new schools and retail food facilities - require decisions by municipal officials; thus, partnerships are essential.
- Interventions may include promotional and awareness-raising activities, but these should be part of a long-term, multi-component intervention rather than one-time activities (and should be accompanied by targeted follow-up with different population groups).
- All actions aimed at preventing excess weight gain and improving diet (including reducing energy intake) and activity levels in children and young people should actively involve parents and caregivers.
- All community programs to prevent obesity, increase activity levels and improve diet (including reducing energy intake) should address the concerns of local people from the outset. Concerns might include: the availability of services and the cost of changing behaviour; the expectation that healthier foods do not taste as good; dangers associated with walking and cycling; and confusion over mixed messages in the media about weight, diet and activity.
- Any program to prevent obesity in pre-school, childcare or family settings should incorporate a range of components (rather than focusing on parental education alone), such as:

  <u>Diet</u>

  - Interactive cooking demonstrations, videos, and group discussions on practical issues such as label reading, meal planning, and shopping for food and drink;
  - Limiting consumption of energy-dense snack foods high in sugar and fat;
  - Limiting consumption of ‘fast food’;
  - Encouraging children to eat regular meals, including breakfast, in a pleasant, sociable environment without distractions (such as TV);

- Encouraging parents and/or caregivers to eat with children – with all family members eating the same foods;

Physical Activity

- Interactive demonstrations, videos, and group discussions on practical issues such as ideas for activities, opportunities for active play, safety, and local facilities;
- Encouraging unorganized active play (e.g. dancing & skipping);
- Encouraging families to be more active together – for example, walking and cycling to school and shops, going to the park, or swimming;
- Gradually reducing sedentary activities – such as watching television or playing video games to no more than 2 hours per day – to encourage more activity and less food consumption; and,
- Encouraging children to participate in sport or other active recreation, and to make the most of opportunities for exercise at school.

**Appendix I: Process, Output and Outcome Indicators for Effective and Promising Policy Options for Physical Activity in Schools**

| Policy Area | Policy Option | Possible Process and Output Indicators | Possible Outcome Indicators |
|---|---|---|---|
| **Daily, quality, safe physical education (PE)** | Raise the quantity and quality of PE at schools, aiming for daily PE throughout the school years. Specific daily goals should be established that take into account unique (sub) national l characteristics, as well as new evidence on required levels. | - % schools providing daily PE using minimum time set in (sub) national policies<br>- % mandated PE classes actually taught | - survey students on satisfaction of PE curriculum<br>- focus testing students input on preferred PE content |
| | Provide a variety and choice of physical activities that meet specific needs for all children and youth (recognizing age, development, disability and gender). | - % schools meeting pre-determined (sub) national standards | - % disabled students in PE per school-year<br>- survey disabled students or parents on PA satisfaction - % students with positive attitudes towards physical activity |
| | Ensure that students are physically active for a large percentage of PE class time. | - % PE lessons meeting pre-determined standards<br>- % students 'excused' from PE each school year<br>- % PE classes cancelled per grade level per year | - % students reaching moderate-vigorous PA levels in PE class |
| | Determine the minimum level of qualifications that PE teachers and physical activity leaders should have. | - % mandated PE classes taught by qualified teachers | - compare student satisfaction, fitness, and measures of wellness in PE classes taught by teachers vs. PE teachers |
| **Daily, quality, safe physical activity (PA)** | Consider appropriate integration in other curricula, as well as training and support for implementation. | - % schools using in-class energizer breaks | - student satisfaction, fitness, measures of wellness, and academic test scores in energizer class vs. regular classroom setting |
| | Integrate the physical, psychological, and social health benefits of PA, as well as actual learning methods in various school curricula beyond the PE class. | - % schools meeting (sub) national health curriculum standards | - % students meeting (sub) national health education academic requirements in Health Promoting Schools vs. control schools |
| **Extracurricular** | Provide a variety of PA opportunities, such as sports, non- | - % schools offering a | - student satisfaction survey |

| | | | |
|---|---|---|---|
| **physical activity (PA)** | competitive recreation, active recess (preferably outdoors), and active play through intramural and interscholastic activities that meet the needs, interests, and abilities of all students, and that does not substitute for PE. | variety of extracurricular PA opportunities<br>- % schools providing daily active recess for all students<br>- % schools with gender equitable PA opportunities<br>- % schools with enhanced programs to accommodate special needs students | - % students participating in extracurricular physical activity |
| **Training** | Provide PE teachers and PA leaders, as well as all other teachers and school staff, with adequate, regular and appropriate training to ensure the quality and safety of PE and PA programs. | % schools with qualified PE teachers | - teacher focus group testing |
| **Active transportation to and from school** | Ensure safe walking and cycling on the way to school. | - % schools with an active transportation policy and program<br>- proportion and profile of children bussed to school | - student satisfaction, fitness, and measures of wellness in schools with active transportation policy vs control schools<br>- % students walking or cycling to school |
| **Facilities** | Provide funding to ensure adequate facilities and equipment for PA, including bike racks | - % schools meeting national access, safety & security standards for PA | -% students using school bike racks in Health Promoting Schools vs. control schools<br>- Student satisfaction, fitness, and measures of wellness in Health Promoting Schools vs. control schools |
| **Community outreach** | Establish partnerships with municipalities, community, as well as children and youth organizations to optimize school and community facilities for all members of the community and to offer PA opportunities (including easy access to playgrounds and parks) to all children and youth during non-school hours. | - % schools open after hours for community recreation<br>- % schools using community recreation facilities during school hours<br>- % schools with established links to community providers | - focus testing on satisfaction of community recreation leaders and teachers in Health Promoting Schools<br>- % students participating in community physical activity sessions/clubs |

* adopted from the 'Satellite Expert Roundtable on the WHO Global Strategy on Diet, PA and Health: A School Policy Framework'

## Appendix II: Levels of evidence for intervention studies

| Level of evidence | Type of evidence |
|---|---|
| 1++ | High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias |
| 1+ | Well-conducted meta-analyses, systematic reviews of RCTs or RCTs with a low risk of bias) |
| 1– | Meta-analyses, systematic reviews of RCTs or RCTs with a high risk of bias[a] |
| 2++ | High-quality systematic reviews of non-RCT, case–control, cohort, CBA or ITS studies |
| | High quality non-RCT, case–control, cohort, CBA or ITS studies with a very low risk of confounding, bias or chance and a high probability that the relation is causal |
| 2+ | Well-conducted non-RCT, case–control, cohort, CBA or ITS studies with a very low risk of confounding, bias or chance and a moderate probability that the relation is causal |
| 2– | Non-RCT, case–control, cohort, CBA or ITS studies with a high risk of confounding, bias or chance and a significant risk that the relationship is not causal[a] |
| 3 | Non-analytic studies (for example, case reports, case series) |
| 4 | Expert opinion, formal consensus |

RCT – randomized controlled trial; CBA – controlled before-and-after; ITS – interrupted time series

For each question, the highest level of evidence was selected. If a systematic review, meta-analysis or RCT existed in relation to the question being asked, studies of a weaker design were ignored.

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