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# ***Integrating Research, Policy, and Practice in School-Based Physical Activity Prevention Programming: The School Health Action, Planning, and Evaluation System (SHAPES) Physical Activity Module***

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*The School Health Action, Planning, and Evaluation System (SHAPES) is a data collection and feedback system designed to support population-based intervention planning, evaluation, and field research related to youth. The Physical Activity Module of SHAPES consists of: (a) a machine readable questionnaire to collect physical activity data from all students (grades 6 to 12) in a school, (b) a school administrator questionnaire to assess school policies, programs, and resources related to physical activity, and (c) a school-specific feedback report documenting student behavior and school programs and policies. This SHAPES module provides schools with feedback that enables them to take stock of patterns of activity and obesity within their school, recognize what is (and what is not) in place to support physical activity, and how to plan and evaluate their own prevention efforts. SHAPES enables researchers and stakeholders to identify what interventions work, in what contexts, with what students.*

**Keywords:** youth; adolescent; obesity; physical activity; knowledge exchange; prevention; school; evidence

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The Canadian Cancer Society and National Cancer Institute of Canada are contributing to the development of systemic capacity to link research, evaluation, policy, and practice related to population level intervention. This integration within the emerging integrated primary prevention system for chronic disease is seen as central to the requirements of this system (Asselbergs & Birdsell, 2004). Local data collection and feedback systems are integral to building capacity to integrate research, evaluation, policy, and practice within the emerging prevention system.

The School Health Action, Planning and Evaluation System (SHAPES) is a data collection and feedback system designed to create a more effective bridge between research and public health practice. The impetus for SHAPES stemmed from the mutual need of policy makers, practitioners, and researchers to develop a system for economically collecting and using high quality school level data that could (a) enable local health and education systems to plan, tailor, and evaluate local population health initiatives based on evidence; (b) engage researchers in studies relevant to “real world” intervention by conducting studies that would generate “practice based evidence” (Green, 2006) as interventions are mounted in schools and communities; and to (c) provide a platform to support and study the processes and structures required for effective knowledge exchange.

**Authors' Note:** Contact to the corresponding author or visit <http://www.shapes.uwaterloo.ca> for additional information about SHAPES and samples of the measurement and feedback tools.

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The intent has been to develop an information technology system that measures student risk behaviors at the school level to enhance planning and evidence-based practice for school-based prevention programs and policies. In essence, SHAPES creates a more innovative linkage between research and practice by providing stakeholders with the evidence they need, when they need it, in a context-specific form that is useful and understandable for guiding and evaluating school-based prevention programming. SHAPES was originally designed to address tobacco use (Cameron et al., 2007). In response to demand from community stakeholders, new SHAPES Modules are being designed to address child and adolescent (youth) obesity.

### **► BACKGROUND**

Tobacco use and obesity caused by physical inactivity and poor nutrition account for the majority of preventable cancers (Adami, Day, Trichopoulos, & Willett, 2001; Colditz, DeJong, Hunter, Trichopoulos, & Willett, 1996) and many other chronic diseases and conditions such as cardiovascular disease (Janz et al., 2002; U.S. Department of Health and Human Services [DHHS], 2004) and insulin sensitivity (Schmitz et al., 2002; DHHS, 2004). Although there have been considerable reductions in the prevalence of smoking among Canadian youth during the past two decades (Health Canada, 2002), the prevalence of obesity among young Canadians has more than doubled over the same period of time (Tremblay & Willms, 2000). Because physical activity is a major

determinant of obesity, and physical activity patterns tend to be established during childhood and adolescent years (Centers for Disease Control and Prevention, 1997), it is critical for researchers and practitioners to promote physically active lifestyles as an obesity prevention strategy among the school-aged population.

The promotion of physically active lifestyles within the school context is important, not only because schools provide youth with the knowledge and skills to become healthy and productive adults but also because school-based physical activity accounts for 20% to 40% of youth's total activity (Craig, Cameron, Russell, & Beaulieu, 2001). The Coordinated School Health model posits four areas of influence that the school setting has on youth health: instruction, healthy physical environment, supportive social environment, and services (Felton et al., 2005). That is, aside from curriculum activities to improve student knowledge about the benefits of physical activity, school-based programs and policies (interventions) are also important for providing a school environment conducive to making healthy lifestyle decisions around physical activity. However, at the same time as schools are increasingly being put under pressure to address the decline in physical activity rates among youth (O'Loughlin & Tarasuk, 2003) via prevention initiatives (Botvin, 2004; Boyle, Purciel, Craypo, Stone-Francisco, & Samules, 2004), much of the evidence available to guide their programming decisions is derived from artificially controlled research which would not align with the realities of "real world" public health practice (Boyle et al., 2004; Green, 2006; Ringwalt et al., 2002). This disconnect between research evidence and the needs of teachers, school administration, and/or public health (practitioners) may explain why fewer than 30% of schools implement evidence-based interventions (Ringwalt, Ennett, Vincus, Rohrbach, & Simons-Rudolph, 2004). Evidence will not be utilized unless it is appropriate for local circumstances (Green, 2001; Green & Mercer, 2001).

As described elsewhere (Cameron et al., 2007), SHAPES is an information technology platform and data collection system originally designed to provide practitioners with "real world" data about youth tobacco use and school-based tobacco control prevention programming. The SHAPES Tobacco Module stemmed from previous research experience (Cameron et al., 1999; Manske, Brown, & Cameron, 1997), research highlighting the importance of local data (e.g., Green, 2001; Speller, 2001), and compelling considerations about the practical importance of engaging communities in developing initiatives that fit local circumstances (e.g., the Precede-Proceed health promotion planning model; Green & Kreuter, 1999). A practical local data collection and feedback system was

seen as having great potential to advance research and practice. The Tobacco Module helped to generate better data to enable us to learn what works, for whom, and in what context, and creating linkages between practitioners and researchers necessary to inform evidence-based practice and create practice-based evidence (Cameron et al., 2007). Since 2000, the SHAPES Tobacco Module has been completed by more than 250,000 students in more than 680 schools in Canada and the United States for projects initiated by both researchers and stakeholders. This extraordinary success of the Tobacco Module, which is now used by communities, provinces, the federal government, and researchers for planning, evaluation, (national) surveillance, and research (Cameron et al., 2007), has created momentum to develop additional modules.

Several factors drove development of the Physical Activity Module as a priority. There is concern about the decline in physical activity rates (O'Loughlin & Tarasuk, 2003) and subsequent emerging epidemic of youth obesity (Belanger-Ducharme & Tremblay, 2005; Tremblay & Willms, 2000). There is not an adequate surveillance system for youth obesity and physical activity in Canada (Heart and Stroke Foundation of Canada [HSF], 1999). Stakeholders are seeking physical activity data from the developers of SHAPES (e.g., Ontario Ministry of Health Promotion). These considerations have prompted development of the SHAPES Physical Activity Module.

This manuscript provides details about the Physical Activity Module of SHAPES and describes how it is being used to transform practice based research for physical activity promotion and obesity prevention within the school context.

## ► STRATEGIES

The SHAPES Physical Activity Module consists of three elements: a short, low-cost, machine readable questionnaire that can be administered to all grade 6 to 12 students in a school; a school administrator or staff questionnaire to assess school policy, programs, and facilities related to the physical activity patterns; and school-specific, computer-generated feedback reports for the school administration [also available to other stakeholders (e.g., public health) when appropriate consent procedures are in place].

### *Physical Activity Module Student Questionnaire*

The student questionnaire is used to collect the individual student data pertaining to physical activity and sedentary activity patterns, obesity (height and weight to calculate body mass index [BMI]), correlates for physical

activity and sedentary activity, enabling factors within schools, social influences, and beliefs about opportunities for physical activity offered within the school environment. Survey items were specifically chosen to reflect both science-based (e.g., screen time) and practice-based concerns (e.g., school connectedness). Because this questionnaire was developed to collect data from large school samples during class time, it was purposefully made short (4-pages), quick, and easy to complete (20 min to complete with a pencil on machine-readable forms), and inexpensive (\$1 to \$3 per student, depending on sample size; the larger the sample, the smaller the unit cost). Questionnaire items have demonstrated good reliability and validity (Wong, Leatherdale, & Manske, 2006), and readability and comprehension (Grewal, Manske, Wong, Leatherdale, & D'Souza, 2007) for students in grades 6 to 12. Most notably, our Spearman correlations between self-reported height and weight and objectively measured height and weight were high ( $r = .97$  and  $r = .98$ , respectively), as was the weighted kappa coefficient for one-week, test-retest reliability of BMI ( $\text{kg}/\text{m}^2$ ) based on the self-reported height and weight (0.75). Spearman correlations between our simple self-reported physical activity measures (one measure for moderate activity and one for hard activity that we can use to calculate physical activity in kilocalories per kilogram body weight per day [KKD] for each day of the week) and objectively measured KKD by accelerometer were modest ( $r = .44$ ) but consistent with other validated tools appropriate for youth (e.g., Crocker, Bailey, Faulkner, Kowalski, & McGrath, 1997; Telford, Salmon, Jolley, & Crawford, 2004).

### *Physical Activity Module Environmental Scan Questionnaire*

In addition to assessing individual level variables, research has now recognized that it is critical to understand how context influences behavior and interventions designed to change behavior (Aveyard et al., 2005; Glasgow, Lichtenstein, & Marcus, 2003; Green, 2001; Leatherdale & Manske, 2005). As such, the SHAPES Physical Activity Module includes an environmental scan of the school context pertaining to physical activity. We use an administrator questionnaire to measure physical activity programs or policies within a school (e.g., provision of varsity teams, intramurals, interscholastic sports clubs), physical activity programming built into the school curriculum (e.g., duration, frequency and inclusion of students in physical education classes), and availability and accessibility of equipment or resources within a school that enable physical activities (e.g., gym space, outdoor sports fields,

sports equipment); it is not a survey targeting individual student behavior. The questionnaire is completed by one or more informants from each school who are most knowledgeable about their school environment. These data make it possible to examine how different programs, policies, or structural elements within a school are associated with student physical activity levels. These data can also provide stakeholders and researchers with an understanding of what interventions work, for which students, in which context so that new interventions can be tailored and targeted to the appropriate student or school populations. Where appropriate, the administrator survey items match perception of school policies and programs at the individual level.

### ***Physical Activity Module Feedback Report and Report Card***

There is a growing appreciation of the need to engage with community stakeholders to move research into practice (Green, 2006; Green & Mercer, 2001; Speller, 2001). In response, we have developed two knowledge transfer tools designed to engage school stakeholders. The first tool is a school feedback report which provides school stakeholders and/or local public health with school-level understanding of what is happening within their specific school using data from the student questionnaire. The report details the activity level and patterns of their student population, the obesity rates of their student population, and the attitudes their students have about physical activity opportunities, resources, and equipment in their school. The report uses standard items to enable comparisons of physical activity and inactivity rates to provincial (state) and national norms. The feedback report also offers evidence-based suggestions for interventions, programs, and policies designed to improve the activity levels of their student population.

The second tool is a report card based on responses to the environmental scan questionnaire that reflects the comprehensiveness and appropriateness of the physical activity policies and programs offered within the school. The report card details how well a school performs within five domains: facilities (e.g., access, adequacy in meeting student needs), programs (e.g., availability and characteristics of curricular physical education and extracurricular physical activity programs for students), policies (e.g., existence of school health policies related to the provision and promotion of opportunities for students to participate in physical activity), social climate (e.g., characteristics of the school environment that encourage and enable enjoyable, lifelong participation in physical activity), and outcomes (e.g., student participation in school physical

activities, overall physical activity levels as an outcome measure of school capacity for physical activity). For each of the five domains, the report card lists evidence-based recommendations for better-practice.

Both feedback reports are produced via an automated, quality-controlled procedure designed to ensure efficient, accurate data scanning and direct input to analysis programs (using Dynamic Data Exchange and SAS software) that generate and export data to a Microsoft Word template. Even in large scale studies, the interval between data collection and feedback is less than 6 weeks, allowing stakeholders to quickly see “at a glance” what is happening at their school, so that they can plan their future intervention activities based on their own local evidence.

## **► DISCUSSION**

There is a growing recognition that new linkages are required to bring together researchers and practitioners so that they are better able to work effectively together to improve the health of the population (Cameron, Jolin, Walker, McDermott, & Gough, 2001). Given the significance of the school setting for influencing physical activity patterns and the urgency of implementing more effective initiatives to promote physical activity among youth (Dietz & Gortmaker, 2001; Tremblay & Willms, 2000), researchers and practitioners need to work together to ensure that contextually appropriate interventions are integrated into practice (Cameron, Bauman, & Rose, 2006; Green, 2001, 2006; Green & Mercer, 2001). We believe that the necessary linkages between research and practice around physical activity promotion and obesity prevention within the school context can be fostered with the SHAPES Physical Activity Module. We also believe that SHAPES fosters decision makers to encourage evidence informed practice within the “larger” (i.e., regional, provincial, etc.) school system.

The SHAPES Physical Activity Module provides researchers and practitioners with an efficient and affordable way to monitor activity and inactivity patterns of the student population, to evaluate how program or policy changes affect these activity patterns, and to efficiently target future prevention initiatives, which can save time, money, and limited resources. For instance, without promotion, the Physical Activity Module was completed by more than 65,000 students in more than 80 schools within the province of Ontario within the early months of it being available. Demand among local public health agencies for locally relevant data drove the number of schools up from the original plan of 64 schools. The rapid implementation and demand among government ministries, public health, and school stakeholders has been fueled by

the research–practitioner partnerships created by SHAPES, the ability of the system to provide stakeholders with local data, and the speedy translation of research data into context-specific prevention practice recommendations. Public health has proven an invaluable partner in linkage with the education system and sustainable action based on the SHAPES feedback.

The timely translation of research into practice recommendations is one of the innovative components of SHAPES. We know that the decision making processes of practitioners can be enhanced if they have timely, context-specific information and data to guide their programming decisions (Cameron et al., 2001). However, the traditional system for moving evidence into practice is a “producer-push” system where research findings are marketed in a unidirectional fashion from researchers to stakeholders (e.g., via journal publications). This approach is not only slow, but it is also ineffective at influencing the decision making process (Dobbins, Ciliska, & DiCenso, 1998) and appears to have very little impact on the implementation of new approaches in practice or policy (Grunfeld et al., 2004). Although SHAPES data can be used by researchers in a “producer-push” fashion (e.g., Leatherdale, 2005, 2006; Leatherdale, Sparks, & Kirsh, 2006), the SHAPES feedback reports create a new mechanism for providing stakeholders with timely, context-specific research findings and recommendations for action. For instance, the SHAPES-Ontario project, which implemented the Physical Activity Module in a large sample of Ontario secondary school students (refer to <http://www.shapes.uwaterloo.ca/ontario> for additional details) demonstrated that SHAPES not only helped to establish relationships among those in research, public health, and education, it was also identified that stakeholders commonly report that the timely local data provided in the feedback reports are being used to support evidence-based practice.

Another innovative component of the SHAPES Physical Activity Module is that it provides infrastructure for evaluating school-based physical activity interventions. The data from multiple schools can be combined to create databases that enable examination of natural experiments. For instance, we can determine over time which schools have the highest rates of physically active students and why; such insight can then be disseminated to similar schools with largely inactive student populations. This quasi-experimental evaluation provides a complement to clinical trials for determining what works, and where, in essence generating practice-based evidence (Biglan, Ary, & Wagenaar, 2000; Green, 2006), and would be highly relevant to stakeholders (Judd, Frankish, & Moulton, 2001). Although this evidence may be imperfect, it is more economical and relevant to the stakeholder community

(Biglan et al., 2000; Judd et al., 2001). By providing the ability to design and evaluate school-based interventions, we have created a multidirectional flow of knowledge between both stakeholders and researchers.

In Canada, schools are experiencing unprecedented requests for data collection with their students. National and provincial surveys have been unable to collect any data in certain major metropolitan areas because of the response burden being placed on schools (Health Canada, 2002). Clearly, coordination and collaboration among surveillance agencies is one part of the solution. But another part is being relevant to the education system. SHAPES attempts to fill this niche by providing feedback reports, by including school stakeholders in the research process, and by linking school stakeholders with practitioners working in public health. The modular design of SHAPES (i.e., Tobacco Module, Physical Activity Module) also helps to make our school-based research less demanding on the participating schools. Using classroom-based, cluster-randomized sampling, we are able to collect representative data from an entire school pertaining to physical activity and tobacco, while maintaining a 20-min limit on total time to complete the questionnaire. By using a modular approach, we can more economically and efficiently collect data for a wider variety of behaviors without increasing the burden on participating schools or their student population.

The existing infrastructure associated with this data collection system coupled with the simple yet reliable and valid self-report measures included in the student questionnaire (Wong et al., 2006) could also act as a surveillance system for monitoring trends in youth obesity and activity levels at the local, provincial, or national levels. This could help fill an important gap in existing national surveillance systems (HSF, 1999). Moreover, because efforts to prevent youth obesity should focus on both youth who are overweight and the population of youth who are not yet overweight (Dietz & Gortmaker, 2001), surveillance with SHAPES provides the ability to identify the different subpopulations of youth so that interventions can be tailored and targeted appropriately.

### ***Future Directions***

We are continually working on improving and evolving SHAPES so that it is more useful to stakeholders. For instance, we are currently working on making the feedback system more accessible to more stakeholders by developing an interactive Web-based database to allow stakeholders to access SHAPES data (identifiers are removed to ensure confidentiality) for local analysis on topics of specific interest locally (e.g.,

allows programming comparisons to similar schools), and developing a collection of the “stories” of action from other stakeholders (e.g., these stories can provide stakeholders with unique insight about issues, difficulties, or strategies to move different programs and policies into practice).

Furthermore, evaluations of the impact of simple provision of feedback (e.g., in the form of the SHAPES reports) have shown this knowledge transfer mechanism results in limited action on the part of schools. We are involved in studies exploring how knowledge brokering can facilitate such action, especially when integrated into an ecological influence model. Such integration has potential to lower research or surveillance costs where public health sees provision of local data as helping fulfill their mandate.

Because of growing stakeholder demand and the success of SHAPES in tobacco control and physical activity promotion, we are in the process of developing an Eating Behavior Module for SHAPES. With expert advice and stakeholder input, we are developing and validating a student questionnaire, environmental scan, and feedback reports to address issues related to student eating behavior in the school environment. The creation of an Eating Behavior Module will provide stakeholders with insight regarding student eating behavior patterns, the role of the school environment in student eating behavior, and provide a more comprehensive understanding of the youth obesity issue when linked with data from the Physical Activity Module. Stakeholder demand has also prompted us to begin exploring data collection methodologies, such as parent or teacher surveys, which would be amenable for use with younger elementary school students (grades 1 to 5), as this is a critical developmental period for many risk behaviors.

### **What About the School Health Index (SHI)?**

The United States Centers for Disease Control and Prevention developed the SHI Self-Assessment and Planning Guide as a tool for (a) enabling schools to identify strengths and weaknesses of their interventions, (b) enabling schools to develop action plans for improving student health, and (c) engaging stakeholders in promoting health-enhancing behaviors. The SHI is widely recognized in the United States for providing practitioners with general insight to inform programming decisions; however, we feel that if that system were also designed to evaluate interventions, provide practice-based evidence, engage stakeholders in the research enterprise, and provide researchers with a information technology platform to collect large samples of data, it

could have even more impact. We have moved beyond developing a system for evidence-based practice (i.e., SHI) to developing a system for practice-based evidence (i.e., SHAPES). As such, members of the SHAPES research team are in the process of actively consulting with scientists in the United States to determine how best to implement or adapt SHAPES for use in American schools. Not only would this provide U.S. schools with valuable tools for program planning and evaluation, but it would also allow for quasi-experimental evaluation of programs and/or policies via natural experiments within American and Canadian jurisdictions. For instance, the impact of the graphic Canadian tobacco warning labels on youth was examined by collecting longitudinal data (starting with a prelabel baseline) from 12,000 students in both Canada and the United States, using American students as the control group (Fong, Cameron, & Brown, 2002).

## **► CONCLUSION**

SHAPES is a data collection system that is expanding to become an innovative tool for youth physical activity and obesity surveillance, and the targeting, planning, and evaluating of school-based interventions designed to improve activity rates among youth and prevent or reduce obesity. SHAPES is being structured not only to provide school-level activity and obesity monitoring data, but also to assist school-based teams to plan and evaluate their prevention efforts, to assist policy-makers and practitioners to establish the relationship between specific school settings and student physical activity and obesity, and to assist researchers to understand how student characteristics and the characteristics of the school a student attends are related to their physical activity and eating behavior patterns. We believe that the SHAPES Physical Activity Module provides a mechanism for guiding practice-based evidence in this health behavior domain.

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