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***Social Disparities and Involvement in Physical
Activity: Shaping the Policy Agenda in Healthy
Living to Successfully Influence Population Health***

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Social Disparities and Involvement in Physical Activity : Shaping the Policy Agenda in
Healthy Living to Successfully Influence Population Health

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Background

Social Determinants of Health Research in Canada

A substantial body of research shows that health outcomes are associated with social, cultural, and economic features of living environments and of individuals (Adler & al., 1994; Berkman & Kawachi, 2000; Evans, 2002; Evans, et al., 1995; Marmot et al., 1997; Marmot & Shipley, 1996; Robert, 1999; Robert & House, 2000). For instance, numerous studies have shown that mortality, longevity, and healthful lifestyles are inversely related to individual-level and ecologic-level socio-economic status (Evans, 2002; Kawachi, 2000; Rodgers, 1979; Wilkinson, 1992). In addition to the demonstrated association of low average income, the level of income inequality has also been discussed as a determinant of health outcomes (Kawachi et al., 1999a, b, 2000) although consensus has not been achieved on whether or not inequality is a determinant of the health of populations (Wagstaff & van Doorslaer, 2000).

While the existence of important relationships between social determinants and health outcomes is now a matter of record, there are significant debates currently on how to shape public policies to reduce social and health disparities and to improve population health (Evans, 2002; Evans & Stoddart, 2003; Lessard, 2003; Kindig & Stoddart, 2003; Coburn et al., 2003; Glouberman & Millar, 2003; Raphael, 2003; Adler, 2003; Fleming, 2003; Mackenbach, 2003; Shonkoff, 2003). The need to survey and evaluate social policies has been underscored as has been the need to develop a conceptual framework for formulating public policies.

Physical Inactivity as a Public Health Issue

Physical inactivity has been recognised as a significant public health problem in Canada and many industrialised nations (*Federal-Provincial Territorial Fitness Committee*, 1997; Pate, 1995; Fletcher et al., 1992) because diseases associated with a sedentary lifestyle create significant economic and social burdens (Craig et al., 2011a, b; United States Department of Health and Human Services [USDHHS], 1996; Katzmarzyk et al., 2000) and the prevalence of physical inactivity is high (Craig et al., 2001a, b). Furthermore, it appears as though social disparities exist in the distribution of physical inactivity in the population: women, older persons, selected ethnic groups, aboriginal peoples, and socio-economically disadvantaged persons show more sedentary lifestyles. In addition, these disparities seem to have been maintained for at least 25 years (Craig et al., 2001a, b, 2002; www.cflri.ca). Interestingly, some researchers (Duncan et al., 1993, 1996, 1999; Gauvin et al., 2001a, b) have reported that the prevalence of health-damaging behaviours (e.g., smoking, delinquency) including physical inactivity is higher among populations that live in more deprived areas (i.e., lower concentration of university-educated persons, lower average family income) even after controlling for individual difference variables.

Over the past 20 years, a substantial body of research has been developed that deals with individual-level determinants of physical activity (Sherwood & Jeffery, 2000; Wetter et

al., 2001) and more recently social-environmental determinants of physical activity (Booth et al., 2001; Orleans, 2000; Sallis, et al., 1998; Torres et al., 2001). In addition, there have been efforts to compile extant research on interventions (Blair et al., 1998; Dunn et al., 2002; Dishman and Buckworth, 1996; Gauvin, 2003; King, Rejeski & Buchner, 1998; Taylor, Baranowski & Rohm-Young, 1998; Stone, McKenzie, Welk & Booth, 1998; www.thecommunityguide.org) and to formulate guidelines on how to influence involvement in physical activity (USDHHS, 1999). While there is a reasonable consensus on the scope and nature of interventions that can be used to promote physical activity in individuals, there are comparatively less data on interventions that might be implemented to effect population level changes.

Connecting Two Parallel yet Distinct Areas of Research and Intervention

In addressing the public health issue of inactivity, few authors (see Brownson et al., 2001; Duncan et al., 2002; Frankish et al., 1998) have overtly addressed the issue of their social determinants despite the data that show inverse associations of activity involvement in relation to socio-economic status. Implicitly or explicitly, the *modus operandi* in this area has been to act on physical activity to influence population health indicators. In parallel, yet independently, few persons interested in policy interventions to reduce social and health disparities (see Raphaël, 2003 for an exception) have explicitly addressed the specific target and scope of such policy interventions (Adler, 2003; Fleming, 2003; Mackenbach, 2003; Northridge, 2003; Shonkoff, 2003). Implicitly or explicitly, the *modus operandi* in this area has been to act on socio-economic factors (e.g., redistribution of collective riches through national or provincial social programs) to influence population health. There are little or no data dealing with the impact of policy interventions (either directed at socio-economic disparities or physical activity) on changing the configuration of relationships between social determinants, prevalence and distribution of involvement in physical activity, and population health indicators. Thus, it is unclear whether public policies should attempt to (1) modify socio-economic imperatives and circumstances; (2) attempt to modify population-level parameters of healthy living; or (3) simultaneously act on both fronts. Numerous questions remained unanswered including:

- By acting on social determinants will there be changes in the prevalence and distributions of physical activity and subsequently population health indicators?
- By acting on the prevalence and distribution of physical activity patterns will there be influences on population health indicators?
- Is it possible to act on prevalence and distribution of physical activity to influence population health?
- Given the knowledge base, how should healthy living policy be shaped in the future?

Statement of the problem

The propositions to be explored in this paper are as follows:

- Social determinants including sex, age, gender, being aboriginal, and immigrant status but especially education and income appear to be associated with physical activity both at the individual and population levels.
- Sedentary lifestyles have been causally associated with health indicators at the individual level and there is evidence that increasing population prevalence of physical activity could have significant positive impacts on population health indicators including mortality, longevity, cardiovascular morbidity, and psychological well-being.
- Sedentary lifestyles are more prevalent in socially disadvantaged groups including women, older persons, aboriginal peoples, ethnic groups, but especially persons with lower levels of education and limited income.

However, researchers and policy-makers are at a loss currently in determining the breadth and focus of public policies needed to reduce inequities in population health indicators (i.e., acting on socio-economic disparities or specific public health issues such as high prevalence and unequal distribution of physical inactivity in the population).

Purposes of the Paper

- To formulate a statement regarding the direction and magnitude of the relationship between socio-economic disparities and involvement in physical activity across different population subgroups;
- To explore whether or not socio-economic disparities act as moderators or mediators of the influence of interventions (psychosocial, community, or otherwise) on physical activity measured at the individual and population levels;
- To explore whether or not interventions designed to reduced socio-economic disparities may result in changes in the prevalence and distribution of physical activity in the population;
- To formulate recommendations regarding the policy agenda in healthy living.

Socio-economic Disparities and Involvement in Physical Activity

Dose of Physical Activity to Achieve Health Outcomes

Physical activity refers to any bodily movement that increases energy expenditure above resting rate (Bouchard et al., 1992). Obviously though, not every physical activity is sufficient to result in health benefits. As a result, researchers have strived to operationalize the concept of physical activity and to determine quantities and types of physical activity that can result in health outcomes.

In this regard, physical activity can be described according to type (main physiological systems that are activated during activity [aerobic or cardio respiratory systems, musculo-skeletal apparatus, flexibility]), frequency (number of times a person engages in an activity over a pre-determined period of time), duration (quantified in minutes of elevated energy expenditure), and intensity (degree of overload on selected physiological systems in comparison to resting states). Furthermore, activities can be characterized in terms of the location/social setting in which they occur (e.g., leisure time activity, occupational activity, transportation).

There are two complimentary recommendations regarding the volume of physical activity required to achieve health benefits (USDHHS, 1996). Optimal benefits from physical activity can be achieved if people exercise aerobically 3 to 4 times per week for 20 to 30-min at 65 to 75% of maximal aerobic capacity (Pollock et al., 1998). However, because the relationship between dose of activity and health benefits is positively curvilinear (i.e., decelerating increase), significant benefits can be realized if sedentary people cumulate 30 minutes to 60 minutes of moderate intensity (around 50% of maximal capacity) physical activity on most, preferably, all days of the week (Canadian Guide to Healthy Physical Activity, www.paguide.ca; Pate, 1995; Pate et al., 1995).

Establishing population prevalence of physical activity has typically involved creating indicators of the proportion of persons considered to be sedentary enough to eventually be at risk of developing hypokinetic diseases or of the proportion of persons considered to be sufficiently active to accrue health benefits. Development of these indicators involves combining responses to a questionnaire on involvement in different physical activities, estimating energy expenditure of different activities (through combinations of type, frequency, intensity, duration, and intensity), and setting cut-off points for activity categories. In Canada, people are most often categorized as being either active (3 kilocalories/kilogram/day [KKD] – equivalent to 60 minutes of brisk walking [5km/hour]), moderately active (1.5 KKD – equivalent to 30 minutes of brisk walking per day), or inactive (0 to 1.4 KKD). For children and youth, caloric expenditure required to achieve the status being active is higher (6-8 KKD vs. 3 KKD) because proper growth and maturation require greater amounts of activity. Furthermore, population distributions of physical activity have typically been examined according to well known stratification variables including age, sex, education, income, and location of residence (rural vs. urban).

In Canada, there are two national-level organizations that have collected information for population prevalence and distribution of physical activity, namely the Health Canada (through the NPHS) and the *Canadian Fitness and Lifestyle Research Institute*. The latter organization has the most extensive and detailed data (including longitudinal and repeated cross-sectional population surveys since 1981). Selected provinces also have population level data relevant to the populations living in their territories (Enquêtes sociales et de santé in Québec, www.stats.gouv.qc.ca; Ontario Health Surveys). Unfortunately, there are limited population data for aboriginal peoples and persons from ethnic groups. In the following paragraphs, a description of the prevalence and distribution of physical activity in Canada is drawn. Selected comments on the stability of these patterns over time are also presented.

Prevalence and Distribution of Physical Activity in Canada¹

According to the National Population Health Survey (NPHS) – 1998/99, 55% of Canadians are inactive (≤ 1.4 KKD). The 2001 Physical Activity Monitor (PAM performed by the *Canadian Fitness and Lifestyle Research Institute*) shows that 57% of Canadians are either inactive or moderately active (< 3 KKD). Both surveys show that women are more inactive than men (NPHS=59% vs. 52% ≤ 1.4 KKD; PAM= 64% vs 50% ≤ 3 KKD), younger adults are less inactive than older adults (NPHS=43% are ≤ 1.4 KKD among 20-24 year olds vs. 62% among persons older than 65 years; PAM= 43% are < 3 KKD among 18-24 year olds vs. 69% among persons older than 65 years), and that inactivity levels are greater in Eastern Canada than Western Canada (NPHS=61% are ≤ 1.4 KKD in Eastern provinces vs. 47% in British Columbia; PAM= 61% are < 3 KKD in Eastern provinces vs. 47% in British Columbia) with an approximate gradient from East to West. Among aboriginal peoples, the prevalence of inactive lifestyles is becoming an important focus of diabetes prevention interventions (McAuley et al., 1997) because of rapidly increasing incidence of this disease among aboriginal peoples. While prevalence data are more difficult to locate, there is a general consensus in the literature that the prevalence of inactivity is high among aboriginal peoples (Thompson et al., 2001; Henderson & Ainsworth, 2000; Bolen, 2000). Activity levels among ethnic groups (Crespo et al., 2000; O'Loughlin et al., 1999; Parks et al., 2003) is also high.

Furthermore, according to the NPHS 1998/99, about 62% of persons without a high school education are inactive whereas only 51% of persons with post-secondary education are inactive. About 62% of persons with a household income of \$20 000 or less are inactive whereas only 44% of persons with a household income of \$80 000 or more are inactive.

Patterns of inactivity are also very high among children and youth. Among children aged 5 to 17 years as much as 57% may not be sufficiently active. Even at young ages girls tend to be less likely to be active with only about 38% being considered physically active

¹ Unless otherwise specified, information reported in this section was obtained by consulting extensive online documents available on the Web Site of the *Canadian Fitness and Lifestyle Research Institute*.

in comparison to 48%. Among teenagers about 58% do not meet the > 3KKD criterion and 84% do not meet the 6-8 KKD criterion. Only about 12% of girls and 20% of boys meet the 6-8 KKD criterion. Still among teenagers, it appears as though those who come from families with higher income are less likely to be inactive (44%) in comparison to teens whose families report lower incomes (57% to 67%).

In addition, inactivity levels have decreased since 1981². At that time according to the Canada Fitness Survey, only 21% of Canadians were active (3 KKD or more). In 2001, this proportion had increased to 43%. Data from the NPHS show that inactivity (less than 1.5 KKD) has decreased between 1994 (62%) and 1998 (55%). Interestingly, prevalence of inactivity has significantly decreased in Newfoundland, PEI, Nova Scotia, Ontario, and Québec. Of greater intrigue in the context of this report, inactivity decreased between 1994 and 1998 for persons with less than secondary education and persons with either some post-secondary education and post-secondary education but not among persons with secondary education. Along the income gradient, only the prevalence among persons in the higher income brackets (between \$60000 and \$80000, or persons above \$80000) decreased significantly. Whereas the percentage point differences across income brackets was only 11% in 1994 (65% vs. 54%) it climbed to 18% in 1998 (62% vs. 44%).

In sum, the prevalence of physical inactivity is high and the prevalence of active lifestyles is low. Prevalence of inactivity is higher among women, older persons, aboriginal peoples, and persons who are members of ethnic groups. Prevalence of inactivity follows a gradient that is a function of education and income. While the prevalence of inactivity has decreased in recent years, this decrease has been disproportionately observed among more advantaged population subgroups (e.g., with higher family income).

Prevalence and Distribution of Correlates of Physical Activity

In keeping with the burgeoning literature on individual-level determinants of involvement in physical activity (Seefeldt et al., 2002), population health surveys have included measures of psychosocial variables associated with physical activity (e.g., beliefs about the consequences of involvement in physical activity, perceived barriers, fitness opportunities). The prevalence of psychosocial profiles conducive to physical activity involvement can therefore be examined. It is striking that socio-economic disparities are associated with determinants of activity involvement. For example, children whose parents report higher income also report greater use of private exercise facilities in comparison to persons with lower income. Similarly, the higher the education level among person with employment outside the home, the more likely they are to report that they have pleasant places to walk and have access to fitness facilities at the workplace.

² The decreased prevalence of inactivity in Canada seems to be at odds with data indicating that obesity levels are on the rise as one might expect that increased levels of activity might be associated with decreased levels of obesity. This phenomenon (increase in prevalence of obesity despite increases in the prevalence of activity) is known as the obesity paradox (Heini & Weinsier, 1997) and is not well understood at this point in time.

Furthermore, women are less likely to report that they have access to showers and change rooms at work in comparison to men. Persons with higher income report stronger beliefs in the stress reduction potential of regular physical activity. These and other similar data (Brownson et al., 1995, 2001; Duncan et al., 2002; Lindström et al., 2003) suggest that determinants of activity involvement espouse a gradient that is a function of many social determinants.

Conclusions

Physical Activity involvement is strongly and consistently associated with social determinants: age, gender, education, family income, being a member of an ethnic group, being aboriginal. These disparities are present in the current population statistics (2001) as they were 20 years ago (1981). The disparities as a function of education and income are particularly striking and parallel literature on social determinants of health.

While the prevalence of inactivity has decreased and the prevalence of activity has increased, the disparities have not decreased. In fact, the gap between the rich and the poor has actually augmented. The prevalence of inactivity has decreased only slightly in socio-economically disadvantaged groups but it has decreased dramatically among persons with higher income and education.

Many of the disparities in physical activity are paralleled by disparities in psychosocial determinants of activity involvement such as beliefs about the benefits of activity, programs, and infrastructures for involvement in physical activity.

Intervention Literature

Historical Perspective and Milestones

There is general consensus that a public health strategy for changing lifestyle behaviours should include both individually-based and population-based approaches (Gauvin, Lévesque, & Richard, 2001a; Glasgow et al., 1999; Jeffery, 1989; Rose, 1992). Individually-based approaches involve intensive, multi-session interventions often delivered by health professionals in a medical or psychotherapeutic setting. By contrast, population-based approaches are less intensive, delivered by lay leaders or automated through the presence of particular environmental features, and they unfold in natural life settings such as the workplace or the community. Individually-based interventions can be adapted for widespread distribution (mail-based or internet-based approaches) but truly population-based approaches involve the modification/transformation of environmental features of real-life milieus.

Researchers have studied the efficacy of physical activity interventions targeted to the individual and to the community (Blair & Morrow, 1998; Centers for Disease Control and Prevention, 2001; King et al., 1991, 1994, 1995; Schooler, 1995; USDHHS, 1999; www.thecommunityguide.org ; van der Bij et al., 2002). Other investigators have either conceptually examined the value of policy advocacy intervention (King et al., 1995) or

suggested public policy and legislative initiatives to enhance physical activity (Brownson et al., 2001; Blair et al., 1996). The main outcome variables in these intervention studies are involvement in physical activity at the individual level rather than at the population level. Furthermore, there is very little information regarding how to promote physical activity among minority groups or among persons who are disadvantaged. Any information that is available reflects the socio-cultural forces and groups in the United States (i.e., comparing intervention efficacy across populations of persons who report being Caucasian, African-American, or Hispanic) rather than in Canada (i.e., respecting and cultivating the Canadian cultural mosaic). There is therefore some data pertaining to efficacy of interventions among African-American adults or Latino women. There is virtually no data on how interventions designed to reduce socio-economic disparities or increase opportunity structure in a culturally-appropriate manner might increase the prevalence and distribution of activity.

Status of the Knowledge Base

A previous review conducted for Kino-Québec (Gauvin, 2003) and for a book chapter (Gauvin et al., 2001) showed that extant literature reviews and meta-analyses (Dishman and Buckworth, 1996; Dishman et al., 1998; Kahn et al., 2002; King, Rejeski & Buchner, 1998; Taylor, Baranowski & Rohm-Young, 1998; Stone, McKenzie, Welk & Booth, 1998; www.thecommunityguide.org) supported the efficacy of a variety of individually-based interventions. Interventions including some combination of activity courses, cognitive-behavioural techniques or evaluation of risk factors delivered in school, hospital, or community settings could significantly increase participation in physical activity in individuals. Dishman et al. (1996) observed effect sizes³ ranging between .10 and .92 suggesting wide variability in intervention impact. Smaller effect-sizes were observed when the type of physical activity was a muscular strength and endurance training and larger effects were observed when the goals were to increase involvement in moderate-intensity physical activity. Studies targeting activity change through interpersonal or social influences (e.g. Epstein, 1985; Nader et al., 1989; Brawley, Rejeski, & Lutes, 2000) influences have also been shown to be effective.

Population-level interventions have been studied far less frequently but have also shown promise for changing individual-level and perhaps population-levels of physical activity. While there are numerous challenges involved in studying the impact of environmental interventions (Lawlor et al., 2003; Sallis, Bauman & Pratt, 1998), there is consensus that curriculum changes (Stone et al., 1998) can result in increased levels of physical activity but only to the extent that healthy education is coupled with an increase in opportunities for being physically active (Kahn et al., 2002). This is a particularly telling finding because the population data show that only a small proportion of parents (27%) report that their children have access to physical education 3-4 times per week and 10% of parents indicate that their children have no physical education at all (see www.cflri.ca).

³ An effect-size is a standardised measure of the impact of an intervention that is used to compare effects across a series of studies. The effect-size indicator used in the Dishman & Buckworth paper is a proportion of a standard deviation such that a value of 1 would indicate that the persons receiving the intervention would, on average, be one standard deviation above persons receiving the control condition.

However, a recent study (Sallis et al., 2003) showed that while environmental and policy interventions in schools (daily physical education, restructuring leisure time to allow for physical activity) were effective in increasing activity levels among boys but not girls.

Another strategy, often thought of as a population-level strategy, consists of conducting massive social marketing campaigns (Donovan & Owen, 1994). Although this strategy is thought of as a population-level strategy, it is actually an individually-based strategy that is adapted for widespread dissemination. Nevertheless, research shows that social marketing campaigns rarely if ever result in changes in physical activity. Rather, they influence increased knowledge and improved attitudes.

The few studies dealing with environmental changes have shown significant effects. In one study, researchers studied the impact of including signs to encourage stair-use in public transit stations. Placing signs at decision-points was successful in increasing involvement in activity (Blamey et al., 1995; Coleman & Gonzalez, 2001). A study conducted in a military community consisting of changes in cycling paths and increasing availability of fitness equipment showed increases in prevalence of activity (Linenger, Chesser & Nice, 1991). Another study dealing with the creation and implementation of fitness centres in economically deprived areas in Glasgow, Scotland showed that these facilities were well accepted and apparently used by residents (Macintyre & Ellaway, 2000). Their impact on prevalence and distribution of activity in the population is less clear.

One noteworthy aspect of much the intervention literature is that health is rarely measured as an outcome variable. In other words, while the intervention literature may show that intervention packages increase activity involvement, it is unclear whether any changes results in subsequent improvements in individual health or population health. There are however at least two simulation studies or reports that have been performed to support the notion that intervening on physical activity may result in improved population health. For example, following an estimation of costs associated with illness and death attributable to sedentary lifestyles, Katzmarzyk, Gledhill, & Shephard (2000) concluded that “a 10% reduction in the prevalence of physical inactivity has the potential to reduce direct health care expenditures by \$150 million a year”. Similarly, following a report on the cost-effectiveness of intervening on physical activity and in particular on the added-value of intervening on physical activity for Canadian society, Spence et al.(2001) stated that : « The evidence for the benefits that a physically active society will accrue is strong in terms of enhanced quality of life, reduced disease and disability, and reduced health-care costs. Further, physical inactivity is no less of a public health threat than smoking. Some effective strategies have been identified for increasing population-level physical activity participation. A need exists to identify other effective interventions and programs that may be specific to the Canadian context (e.g., northern climate, rural population). In conclusion, federal funding in the active living area should be continued.» (p. 30). To reiterate, it is possible and potentially beneficial to intervene on physical activity to improve health at the individual and population levels.

On moderators and mediators of change, both at the individual- and population-levels ...

Over the past decade, there has been an increase in the publication of literature reviews and intervention studies dealing with physical activity. Whereas in 1988, Dishman published one of the first compendia dealing with physical activity as a public health issue, the number of studies dealing with physical activity has augmented dramatically (Orleans et al., 1999). One of the lessons to be drawn from the first generation of research on interventions to increase involvement in physical activity pertains to the fact that most interventions do not result in widespread effects (Gauvin et al., 2001a). In other words, interventions only influence “... *some of the people, some of the time* ...”. In order to advance the research agenda, there is therefore consensus that researchers should change the focus of intervention studies from searching for main effects to searching for moderators and mediators of intervention effects (Baranowski et al., 1998; Kraemer et al., 2001). A moderator refers to a variable that modifies the relationship between two variables whereas a mediator is a variable that explains the relationship between two variables. For example, if an intervention has a significant impact on increase activity in men but not in women, one would say that sex moderates the impact of the intervention on physical activity. If an intervention results in changes in self-efficacy which subsequently translate into changes in physical activity involvement, one would say that self-efficacy mediates the relationship between the intervention and its effect on physical activity. An interesting question to address is therefore whether or not social determinants are moderators or mediators of the impact of interventions on involvement in physical activity.

In this regard, in October 2001, The *Cooper Institute for Aerobics Research* (www.cooperinst.org) hosted a conference dealing with moderators (variables that are associated with greater or lesser intervention effects) and mediators (intermediary variables that might explain why change occurred) of change in physical activity interventions. One of the purposes of the conference was to take stock into what was known about moderators and mediators. It was concluded that little was known about moderators and mediators and that future research should attempt to tease out such moderating or mediating influences. In keeping with this general finding, it is correct to state that the knowledge base regarding the role of social determinants in moderating or mediating change is limited even though several studies examining the impact of interventions in disadvantaged groups have been conducted (Gittelsohn et al., 1996; Kochevar et al., 2001; McAuley et al., 1997; Narayan et al., 1998; Rowley et al., 2000; Taylor et al., 1998).

However, it should be noted that the health promotion literature more broadly documents one very significant finding: regardless of intervention efficacy, the uptake of health education and health promotion interventions is lower in more disadvantaged groups in comparison to more advantaged groups (Bracht, 1999; Kraemer & Winkleby, 1997; Raeburn & Beaglehole, 1989; Winkleby et al., 1997). In other words, persons with lower education and income are less likely to gravitate towards, sign up for, and persist in a variety of health promotion programs including exercise interventions. This finding is

reminiscent of early studies in the physical activity intervention literature: persons with blue-collar jobs and lower educational achievement persist less in structured physical activity programs (Dishman, 1988). Thus, even if programs are equally effective across population groups, this may constitute a moot point if the most disadvantaged groups do not engage in and persist in these programs. More importantly, if programming is offered at large to the whole population and only advantaged groups use them, then one could surmise that intervening may result in a widening of social disparities (i.e., advantages persons would improve whereas disadvantaged groups would remain the same). This obviously raises some disturbing questions about the ethics of intervening at a population-level that will be addressed further in this manuscript.

Conclusions

Psychosocial interventions designed to increase activity involvement result in small-to-moderate size changes in involvement in physical activity at the individual level; it is unclear at this time whether or not socio-economic disparities act as moderators or mediators of change.

The literature on policy and environmental interventions is too sparse to draw conclusions about their efficacy in changing population levels of involvement in physical activity. There is very little if any data that speak to the role of socio-economic disparities in moderating or mediating changes resulting from policy or environmental interventions.

The intervention literature on physical activity is at an embryonic stage of development. Much more research is needed to determine optimal content, delivery, and efficacy of these interventions. There is little if any information to shed light on the issue of whether or not social disparities act as moderators or mediators of intervention efficacy. However, it is known that persons with low education and income display lower uptake of health promotion/education programs. As a result, it is reasonable to argue that any healthy living strategy designed exclusively to influence physical activity could result in a decrease in prevalence of inactivity but might also increase existing social disparities.

Generalizations

There are currently three emerging strategies for action:

- (1) act on physical activity to influence population health indicators (this is the *modus operandi* in the physical activity literature and parallels work done on other health behaviours such as smoking, dietary fat consumption) , or
- (2) act on social determinants to influence population health indicators (this is the *modus operandi* in health promotion and population health), or
- (3) simultaneously act on social determinants and physical activity involvement (while there is no specific literature on this strategy, the recently released Swedish Public Health Policy [*Towards Public Health in Equal Terms* www.social.regeringen.se/pressinfo/pdf/folkhalsa/jamlik_fh_en.pdf]; *Equity-*

oriented Strategy for Public Health in Sweden: A case Study [www.who.dk/document/E69911.pdf] is explicitly designed to promote equity; it targets both the reduction of poverty and the improvement of active lifestyles).

Ideas emerging from these two areas of research and action are not very well linked. There are little if any data which might support or refute either position. To further complicate matters, in both areas of research, there is a dearth of research and conceptualization regarding how public policy might be formulated to deal with (1) reducing socio-economic disparities, and (2) increasing involvement in physical activity and reducing the burden of sedentary living.

Recommendations:

- 1) The Federal Government should provide added support for research on social disparities and involvement in physical activity; in particular, monies could be set aside for studying processes underlying relationships between social disparities and prevalence/distribution of physical activity in the population and for exploring the joint contributions of social disparities operationalized at the individual and ecologic levels; in particular, it is clear that there is a dearth of data on the prevalence of activity among aboriginal peoples as well as among ethnic groups which should be rectified by the expansion of current population surveillance systems; additionally, a condition for funding intervention research could be that samples be representative of the full range of the population and explicitly look for moderator or mediator effects of social determinants.
- 2) There is a need to achieve consensus on whether the policy agenda in healthy living should aim directly at changing levels of involvement in physical activity (as it was for reducing tobacco demand) or at changing social disparities or both simultaneously; towards this end, the Federal Government could convene a think tank or consensus conference to address this issue. Inspired by the Swedish work, this author believes that there is a need to simultaneously act on both fronts as there is evidence that physical activity interventions may be used less by persons with low education and income.
- 3) Furthermore, there is some evidence to suggest that groups that are least active (women, older persons, less educated persons, persons with low income, aboriginal peoples, persons from various ethnic groups) are also those groups who have more limited access to physical activity facilities. One of the most promising avenues for policy development might be to insure that *all Canadians* have access to high quality physical activity programs and facilities or physical environments that are conducive to greater involvement in physical activity. While the responsibility of ensuring quality daily physical education, access to neighbourhood/community facilities, quality training of health and exercise professionals, and availability of activity programs appropriate for age, sex, and health status is typically a provincial or municipal one, the Federal government

may choose to carve out a role in this endeavour by supporting cutting-edge research and innovation in these areas and by supporting capacity development in research and intervention on social determinants, physical activity, and health. The Federal Government should support additional research into formulating, implementing, and evaluating public policies that might influence involvement in physical activity and that are aimed at reducing social disparities.

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