

# Determining Physical Activity Patterns of Suburban British Columbia Residents

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## ABSTRACT

**Background:** Physical activity is well recognized for its role in disease prevention. Public health surveillance and action is warranted to combat the escalating economic and human costs associated with physical inactivity.

**Methods:** This study examined the proportion of the population who were physically active at intensities, durations and frequencies specified as the minimum to accrue health benefit as per Canada's Physical Activity Guidelines. Data were collected from 769 suburban residents via a telephone survey, and analyzed using three methods: Individual Assessment (IA) where individuals met the required frequency, intensity and duration through a combination of activities; Categorical Assessment (CA) where individuals met the required frequency, intensity and duration in one or more categories leading to duplicated head-counts; and, Time-based Assessment (TA) where individuals met the required time per week (recommended frequency  $\times$  duration) in a category through some combination of activity. Z-scores were used to test the null hypothesis that the proportion of people meeting the criteria in more than one category was zero.

**Results:** The number of people meeting the guidelines in more than one category (CA) is significantly different ( $p < 0.01$ ) from zero for adults and the combined population, but not for children. Enough people are meeting the guidelines in more than one category to significantly influence the percentage calculated if one is not careful to avoid counting duplicates. Furthermore, significant differences were found between IA and TA for children, adults and the combined population with the time-based assessment significantly over-predicting the IA results.

**Interpretation:** While 75% of the respondents reported they had been physically active during the previous week, only 39% of respondents reported enough physical activity to meet the guidelines for health benefits. This number varies widely depending on the method of classification. Canadians should be reminded of the physical activity guidelines by their health care providers to insure that those who are active are active frequently enough to accrue health benefit.

**MeSH terms:** Physical activity; assessment; questionnaire; methods

*La traduction du résumé se trouve à la fin de l'article.*

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The importance of physical activity in disease prevention is well recognized within the developed world.<sup>1</sup> The World Health Organization (WHO) recognizes physical inactivity (along with tobacco use and poor diet) as major preventable risk factors for non-communicable disease, estimating that 60% of all deaths globally and 43% of the global burden of disease can be linked to physical inactivity despite the fact that physical activity is accessible to all. From a public health perspective, the increased mortality and morbidity attributable to physical inactivity suggests that public health surveillance and action is warranted to combat the escalating economic and human costs associated with an inactive population.<sup>2,3</sup> However, to date, physical activity and exercise behaviour have been measured many different ways, making it difficult to reach consensus on standard guidelines and measures.

While there is much research that identifies the amount of physical activity related to specific health outcomes, very little is known about the minimal level of physical activity, or for that matter, the optimal levels of physical activity, for achieving these benefits. In a general population of sedentary adults, performing 30 minutes of moderate-intensity activity on most if not all days would be sufficient to enhance or maintain one's health. Canada's Physical Activity Guide<sup>4</sup> recommends a minimum of 60 minutes of light effort seven days a week, 30-60 minutes of moderate effort four days a week, or 20-30 minutes of vigorous effort four days a week for the maintenance of health. This activity should be supplemented by at least two days of resistance type activities, and regular flexibility exercises.

The purpose of this study was to examine the extent to which an urban population met the guidelines set out by Health Canada and the Canadian Society of Exercise Physiology in Canada's Physical Activity Guide. Further, this study examined the impact of varied methodologies for classifying and reporting the proportion of the population who were active enough to obtain health benefit.

## METHODS

Approximately 7,000 phone calls were initiated using a random sample of all pub-

lished phone numbers. Calls were initiated between 5:00 and 8:30 pm on weekdays, and 12:00 until 8:00 pm on weekends. No follow-up calls were made to households with no answer. The survey was 12 minutes in length and was conducted with the first adult 18 or older who answered the phone; respondents were asked if they had children, and if so, the researcher asked to complete the survey with them as well. The child whose birthday was next was selected, and if the child was aged 5 to 12, the respondent was asked to provide information about the child's activity level. If the child was 13 or older, the researcher asked to speak to the child about his or her activities.

The information used for the present analysis was obtained from demographic questions (age, gender, income, education and occupation) and questions based on the International Physical Activity Questionnaire<sup>5</sup> that examined the person's light, moderate and vigorous physical activity over the previous seven days. Light activity was described as "activity that causes a slight increase in breathing, heartbeat, and body temperature. Some examples of light activity are curling, walking, bowling." Moderate activity was described as "activity that is intense enough to cause heavy breathing, increased heart rate, and body temperature. Some examples of a moderate activity are a fast walk, swimming, dancing, shovelling snow, and biking/stationary bike, and walking on a treadmill." Vigorous activity was described as "activity that is intense enough to cause heavy breathing, a rapid heart rate, and sweating. Some examples of vigorous activities are aerobics, jogging, broomball, ice hockey, cross-country skiing and fast swimming." The same examples were used for both adults and children over the age of 12.

### Analysis

Subjects were classified as either meeting the physical activity guidelines required for health benefit, or as not meeting the criteria using each of three methods:

1. *Individual Assessment*: individuals who met the required frequency, intensity and duration through a combination of activities, such as 3 moderate activities of 30 minutes and 1 vigorous activity of 20 minutes. Individuals were counted once in the lower cate-

gory, and could not qualify in more than one category. This was the criterion method.

2. *Categorical Assessment*: individuals who met the required frequency, intensity and duration in a category. Individuals who met the criteria in more than one category would be counted in more than one category.
3. *Time-based Assessment*: individuals who met the required time per week in a category through some combination of activity. For example, to meet the moderate activity level, individuals had to perform 120 minutes of moderate activity in a week (although could be 2 times at 60 minutes).

### Statistics

Descriptive statistics were calculated using Microsoft Excel. Z scores were calculated to test the null hypothesis that the proportion of people meeting the criteria in more than one category was zero in each of the adult, child and combined populations. This process was repeated to examine the impact of time-based assessment.

## RESULTS

Of those who answered the phone, approximately 29% completed the survey. In total, data were collected for 769 residents, comprised of 581 adults (76%) and 188 children (24%). Of those participating, 40% were male, and 60% were female, with a median age of 40-49 years of age. The distribution of respondents is representative of the real age distribution according to the 2001 census (see Table I).

### Physical activity patterns

Seventy-five percent of the residents over the age of five believe they exercise regularly. Sixty-two percent of respondents reported that they participated in light effort activities, 45% reported that they participated in moderate activities and 34% reported that they participated in vigorous activities over the seven days prior to the survey (see Table II).

### Light effort activities

Sixty-two percent of respondents (367 adults; 113 children) reported engaging in light activities over the previous seven days. Of these, only 18.8% of the adults and

11.5% of the children engaged in light activity for 60 minutes per session seven days a week. This translates into 10.7% of the total population (12% of all adults and 7% of all the children) gaining health benefits solely from engaging in light activities. Walking was reported to be the most performed light activity across all ages with over 60% of the population engaging in light activity walking.

Of the 62% of respondents reporting light activity, the average number of activities performed was 4.4 for adults and 4.3 for children, with a median of 4 for both adults and children. Adult residents who participate in light effort activity averaged 81 minutes per session while children averaged 57 minutes per session; however, the median duration was 55 minutes for adults and 30 minutes for children.

### Moderate effort activities

Forty-five percent of respondents (349 people) reported engaging in moderate activities over the seven days prior to the survey. Of those, 71.1% reported engaging in moderate activity four or more days a week, and 39.2% of the adults and 46.2% of the children engaged in moderate activity four days a week for 30 minutes per session. This translates as 16.5% of all respondents (14.3% of adults and 23.4% of children) gaining health benefits solely by engaging in moderate activities. Jogging on the treadmill and cycling were reported to be the most popular moderate activities in adults and youth respectively, with over 10% of the population engaging in each.

The average number of times a week the residents participate in moderate effort activities was 3.5 times for children and 3.3 times for adults. The median number of moderate effort activities for both adults and children was 3. The average duration of moderate effort activity was 67.5 minutes/session, with a median of 60 minutes.

### Vigorous effort activities

Thirty-four percent of respondents (265 people) reported vigorous activities in the prior week. Of those reporting vigorous activity, 43.4% (45.8% of adults and 39.4% of children) reported engaging in vigorous activities four days a week for a minimum of 20 minutes – the amount suggested under the guidelines to receive health benefits. This represents 11.8% of

**TABLE I**

**Age of Those Participating in the Survey as Compared to the 2001 Census Data**

Age Interval	2001 Census	Survey Respondents
5-9	8%	7%
10-14	8%	7%
15-18	7%	6%
19-24	9%	11%
25-29	7%	6%
30-39	16%	13%
40-49	16%	18%
50-59	12%	12%
60-69	8%	9%
70+	10%	10%

**TABLE II**

**Percentage of Respondents Engaged in Each Level of Activity, Meeting Duration Guideline, Frequency Guidelines, and Meeting Both Duration and Frequency Guidelines**

Activity Level	Percent Engaged in Activity	Meeting Guideline for Duration of Sessions	Meeting Guideline for Number of Sessions	Percent Obtaining Health Benefit
Light (60 min X 7 days)	62%	26%	22.5%	10.7%
Moderate (30 min X 4 days)	46%	30%	16.6%	16.5%
Vigorous (20 min X 4 days)	35%	30%	27.7%	11.8%

**TABLE III**

**Comparison of Various Methods of Classifying Survey Participants**

Adult Population (n=581)	Light	Moderate	Vigorous	% Population Meeting PA Guidelines
	% (n)	% (n)	% (n)	
Individual Assessment	11.88 (69)	14.29 (83)	9.64 (56)	35.81
Categorical Assessment	11.88 (69)	16.35 (95)	12.22 (71)	40.45
Time-based Assessment	19.62 (114)	22.03 (128)	11.53 (67)	53.18
Child Population (n=188)	Light	Moderate	Vigorous	% Population Meeting PA Guidelines
	% (n)	% (n)	% (n)	
Individual Assessment	6.91 (13)	23.40 (44)	18.62 (35)	48.93
Categorical Assessment	6.91 (13)	25.53 (48)	20.74 (39)	53.18
Time-based Assessment	8.51 (16)	40.96 (77)	23.40 (44)	72.87
Combined Population (n=769)	Light	Moderate	Vigorous	% Population Meeting PA Guidelines
	%	%	%	
Individual Assessment	10.66	16.51	11.83	39.00
Categorical Assessment	10.66	18.60	14.30	43.56
Time-based Assessment	16.91	26.66	14.43	58.00

all respondents (9.6% of adults and 18.6% of children).

Running (16%) was the most popular vigorous activity for both adults and children. Within those reporting vigorous activity, the average number of vigorous effort activity sessions adult residents participated in was 3.1, while child residents averaged 3.0 vigorous activity sessions during the 7-day period. The median number of vigorous activities performed by both populations was 3. The mean length of the adult session was 73.4 minutes, and the mean length of session for children was 77.5 minutes, although the median session lengths were 52 and 60 minutes, respectively.

**Comparison of methods**

When analyzed using the three methods, the percent of the population meeting the physical activity guidelines ranged from 39.0 to

72.9% (see Table III). From the data, it was found that 2.0% of the adult sample met the guidelines in both the light and moderate activity category and 2.5% met the guidelines in all three categories. The number of people meeting the guidelines in more than one category is significantly different from zero in adults ( $Z=2.33$ ;  $p<0.01$ ) and the combined sample ( $Z=2.59$ ;  $p<0.01$ ), but not in children ( $Z=1.17$ ;  $p>0.05$ ). The number of people meeting the guidelines according to time-based assessment (minutes per week) was significantly different than the number meeting the guidelines as assessed by individual assessment in all adult, child and combined populations.

**DISCUSSION**

Scientific evidence is convincing, providing strong support for a causal relationship

between physical inactivity and ill health. Getting people to become moderately active, incorporating physical activity into their daily routine, is a goal of public health officials around the globe. With a high prevalence rate, its well-defined link to morbidity and mortality, high direct and indirect costs, and its preventable nature, physical inactivity is a prime candidate for public health surveillance and intervention.<sup>3</sup> Physical activity surveillance systems allow for timely information upon which effective prevention and control strategies can be developed. However, when designing such a system, it is important to insure that the information obtained will allow a fair assessment of present physical activity practices, that there is consistency in the interpretation of such results, and that results can be compared across systems.

Using Canada's Physical Activity Guidelines, the present survey results indicate that 38.5% of adults and 48.9% of children surveyed are currently active enough to realize health benefits as a result of doing so. However, physical activity has been defined and analyzed in many different ways, and comparison of results from one study to another may be problematic.

Macera and Pratt<sup>3</sup> divided the population responding to the BRFSS (1998) into those who met the recommended amount of activity (recommended-activity), those who were active but not meeting the recommended guidelines (insufficient-activity) and those who were inactive (no activity) using guidelines similar to those used in the present study. In doing so, they report that 27% of the US population meet the recommended levels of physical activity. In examining the physical activity behaviours of rural New York state residents, Eaton et al.<sup>6</sup> used the mean number of days participants were involved in "sweat activity". Others have used the average number of minutes respondents have engaged in physical activity over a certain period of time (from one week to a year), or average caloric expenditure.<sup>7-9</sup> While each has merits, the results vary dramatically based on the criteria.

The sensitive nature of surveillance systems is evident in the present analysis, and, as pointed out by others,<sup>3,10</sup> emphasizes the need for full disclosure with regard to methods of subject classification into active

or inactive categories, and better definition of the categories themselves. The Canadian Community Health Survey<sup>7</sup> and several research-specific published physical activity questionnaires report moderate and vigorous physical activity, but did not collect information pertaining to light physical activity. Results from Courneya et al.<sup>10</sup> suggest that all questionnaires should include low intensity categories to reduce the likelihood of people "bumping up" low intensity activity into the moderate activity category in order to be able to report some activity and avoid being labelled as sedentary. Further, it should be noted that the physical activity requirements for health benefits may be different for children and youth than adults, but were not differentiated in the present study.

## CONCLUSION

The active population (75%) in the present study – those who perform regular physical activity – compares well with national data that report 72% of British Columbians to be active on a regular basis.<sup>11</sup> The percentage of residents active enough to meet the Physical Activity Guidelines (39%) is also close to the national average (37%). Our data suggest that the majority of residents in the present study are active; they are just not active enough to receive health benefits. Those who are currently active at the light activity level need to be encouraged to increase the duration of sessions (median to 60 minutes) and to engage in light activity every day (median to 7 days a week). Those who are active at the moderate and vigorous effort level tend to maintain an adequate length of session, but need to be encouraged to increase the number of sessions per week (to a median of 4 days) or to supplement with light activity sessions on alternate days.

Care must be taken in analyzing physical activity data to insure that a true representation of physical activity patterns is deter-

mined. The present research supports the need for frequency and duration information across light, moderate and vigorous activity levels. Further, individual assessment, while time consuming, should be advocated as the criterion method to avoid the significant impact of categorical and time-based physical activity classification on results.

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## RÉSUMÉ

**Contexte :** On connaît bien le rôle de l'activité physique dans la prévention des maladies. Une surveillance et une action de la santé publique s'imposent pour combattre la progression des coûts économiques et humains associés à la sédentarité.

**Méthode :** Cette étude porte sur la proportion de la population dont le niveau d'activité physique respectait les seuils minimaux d'intensité, de durée et de fréquence nécessaires pour améliorer sa santé selon les divers Guides d'activité physique canadiens. Nous avons recueilli des données auprès de 769 habitants des banlieues au moyen d'une enquête téléphonique, et nous les avons analysées en utilisant trois méthodes : une évaluation individuelle (EI) des sujets respectant les seuils de fréquence, d'intensité et de durée en s'adonnant à une combinaison d'activités; une évaluation par catégorie (EC) des sujets respectant les seuils de fréquence, d'intensité et de durée dans une ou plusieurs catégories (certains sujets pouvaient donc être comptés en double); et une évaluation axée sur le temps (ET) des sujets respectant le temps hebdomadaire préconisé (fréquence et durée recommandées) dans une catégorie en combinant certaines activités. Nous avons utilisé des notes Z pour tester l'hypothèse nulle voulant que la proportion des sujets répondant aux critères dans plus d'une catégorie soit égale à zéro.

**Résultats :** Le nombre de sujets respectant les directives dans plus d'une catégorie (EC) est significativement différent de zéro ( $p < 0,01$ ) pour les adultes et pour la population dans son ensemble, mais pas pour les enfants. Suffisamment de sujets respectent les directives dans plus d'une catégorie pour influencer significativement le pourcentage calculé, si l'on ne prend pas soin d'éviter de compter des sujets en double. De plus, nous avons observé des différences significatives entre l'EI et l'ET pour les enfants, les adultes et la population dans son ensemble, l'évaluation axée sur le temps ayant significativement surestimé les résultats de l'EI.

**Interprétation :** Bien que 75 % des répondants aient déclaré avoir été actifs au cours de la semaine antérieure, seulement 39 % ont déclaré des seuils d'activité jugés suffisants pour procurer des avantages pour la santé selon les directives des Guides. Ce nombre variait beaucoup selon la méthode de classification choisie. Les dispensateurs de soins de santé devraient rappeler à leurs patients les directives des Guides d'activité physique pour s'assurer que les Canadiens qui pratiquent une activité physique le fassent à la fréquence indiquée pour en tirer des avantages pour leur santé.