



CANPLAY study: Secular trends in steps/day amongst 5–19 year-old Canadians between 2005 and 2014



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ABSTRACT

Introduction. The Canadian Physical Activity Levels Among Youth (CANPLAY) study collected pedometer data from eight surveys between 2005 and 2014, making it a unique database of objective population physical activity surveillance. The purpose of this study was to describe secular physical activity trends for 5–19 year olds.

Methods. Canadian children from nationally representative samples (10,000 recruited, $n \approx 5500$ per survey) were mailed a pedometer kit, asked to wear the pedometer for 7 consecutive days, log steps daily, then return the log by mail. Weighted medians and prevalence estimates were calculated. Trends were tested by χ^2 test of independence.

Results. An overall median of 10,935 steps/day was taken by Canadian children 5–19 years of age ($n = 43,806$) across the eight surveys. Steps/day increased between 2005–06 and 2007–08, then decreased in 2012–14. The prevalence of taking sufficient steps/day (defined as $\geq 10,000$ steps/day for 5 year olds, $\geq 13,000$ steps/day for 6–11 year-old boys; $\geq 11,000$ steps/day for 6–11 year-old girls; and $\geq 10,000$ steps/day for 12–19 year olds;) also increased then decreased over time, whereas the prevalence of accumulating < 7000 steps/day generally increased over time. Trends were significant for boys, girls and each age group.

Discussion. The CANPLAY surveillance system provided comparable data at multiple time points over 9 years. An overall shift in the distribution of steps/day towards a less active lifestyle occurred between 2005–06 and 2012–14 for boys, girls and each age group. This provides evidence that the national policy goal to increase children's steps/day by 2015 has not been met.

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Introduction

Physical activity surveillance provides essential information for national program planning, delivery, and evaluation. Traditionally, physical activity surveillance has been based upon self-reported behaviours captured via self-completed questionnaires or telephone interviews. The potential sources of bias associated with self-reported physical activity behaviours are well known and are particularly concerned where information pertaining to young peoples' physical activity behaviours is sought (Welk et al., 2000).

Objective measurement of physical activity by accelerometers was included in national surveillance systems, such as the U. S. National Health and Nutrition Examination Survey (Troiano et al., 2008) as early as 2003–04. Accelerometers are important research instruments that provide objective data that can be analysed in different ways to

inform specific study questions. From a public health perspective however, their cost, model upgrades and technological complexity make accelerometers a less practical choice for surveillance (e.g., in schools, community centres, youth clubs, etc.) than more affordable and technologically straightforward pedometers (Pedišić and Bauman, 2015). Pedometer surveillance provides data that is easily interpretable, stable within models (unlike accelerometers which may be subject to more frequent technology changes within models; Pedišić and Bauman, 2015) and readily applicable to a range of users.

The Canadian Physical Activity Levels Among Youth (CANPLAY) study has collected pedometer data continuously on over 43,000 children and adolescents (5–19 years of age) between 2005 and 2014, making it a large and unique database of young peoples' step-defined physical activity. CANPLAY served as the surveillance system to monitor progress against the national/provincial/territorial goal set in 2008 to increase children's steps/day by 2015. CANPLAY's public health contributions to date include a detailed description of the data collection process and data treatment (Craig et al., 2010a), descriptive epidemiology of pedometer-determined physical activity based on its first 2 years of implementation (Craig et al., 2010b), the association between physical

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activity, television watching time and obesity (Tudor-Locke et al., 2011b) and most recently, normative reference data to inform individual standing relative to peers (Craig et al., 2013). The purpose of this analysis of the CANPLAY resource was to describe secular trends in pedometer-determined physical activity for 5–19 year old Canadians and the prevalence of achieving proposed step-defined indices for public health guidelines specific to young people (age–gender specific step/day equivalents). We also assessed youth-specific thresholds proposed to define sedentary lifestyles (<7000 steps/day) (Tudor-Locke et al., 2013).

Methods

Data collection

Details of the CANPLAY data collection protocol have been published previously (Craig et al., 2010a) and are briefly overviewed here. This trend analysis is based on eight cross-sectional, nationally representative samples of households that were selected by random digit dialling annually from 2005–06 to 2011–12, and then again in 2012–14 combined (due to funding constraints). NL2000 pedometers were used April–August 2005 and then replaced by Yamax SW-200 from September 2005 to March 2014. The step data from April to August 2005 was included in the study as there was no evidence of a pedometer model effect on the distribution of data ($p = .10$) and no difference in trends occurred whether the data were included or not.

A short telephone interview was initially conducted with a parent or legal guardian to recruit their children aged 5–19 years and obtain key participant characteristics (including age, gender, parental education, household income, parental activity level). After explaining the study requirements, parents verbally consented to their child's participation in the pedometer portion of the study. Recruitment rates have remained stable over time. Participating families (≈ 5500 annually) were mailed a pedometer data collection kit and later prompted to return the data (see additional details, Craig et al., 2010a). The child participants were asked to wear the pedometer for 7 consecutive days and log their steps daily. Compliance rates averaged just under 50% (e.g., 49% in 2012–14). There was no difference in compliance by children's gender or parent's self-ratings of physical activity level. However, compliance was lower amongst 15–19 year-olds and children living in low income households (lowest income tertile) in earlier study periods (2005–06 to 2009–10 only), and higher amongst 5–10 year-olds and children whose parents reported a university education in five of the eight survey periods. Data quality checks were conducted with returned data according to procedures outlined previously (Craig et al., 2010b). Parental verbal consent was obtained during the recruitment interview, followed by written informed consent/assent. The Human Participants Review Committee of York University approved the protocols for each surveillance period, and the ethics review board for Health Canada also did so in 2010–14.

Data treatment and analysis

Data treatment followed procedures that were thoroughly described in the original process (Craig et al., 2010a) and descriptive epidemiology papers (Craig et al., 2010b). In summary, all returned pedometer data were included in the

analysis regardless of the number of days of step data that were recorded, however, >95% of returned logging sheets contained data for all 7 days (Craig et al., 2009a, b). Daily recorded step counts <1000 and >30,000 steps/day were truncated to those values as a standardised rule to manage potential outliers (Craig et al., 2010b). The median and interquartile range values were computed for steps/day (averaging steps taken over logged days) across the entire eight periods (2005–06 to 2012–14) and by time period separately for boys and girls and by age group (5–10, 11–14, and 15–19 year olds).

Accumulating sufficient daily steps to meet Canadian (Tremblay et al., 2011) and international (World Health Organization. Global Recommendations on Physical Activity for Health. Geneva, Switzerland: WHO, 2010) guidelines of at least 60 min of moderate to vigorous intensity activity (MVPA) every day was calculated according to the age–gender specific criteria determined by Tudor-Locke et al. (2011a). Based on reviews of pedometer/accelerometer studies internationally, the proposed age–gender recommendations to meet 60 min of MVPA were: $\geq 10,000$ steps/day for 5 year olds; $\geq 13,000$ steps/day for 6–11 year-old boys; $\geq 11,000$ steps/day for 6–11 year-old girls, and $\geq 10,000$ steps/day for 12–19 year olds (Table 1). Averaging <7000 steps/day was implemented as a child-specific step-defined sedentary lifestyle index indicative of taking “too few steps” (Tudor-Locke et al., 2013). Prevalence estimates of meeting the sufficient steps threshold every day and of averaging below the <7000 step/day thresholds were computed for both genders and each age group over the entire surveillance period and within each survey.

All data were weighted by the sample weights to account for the sample design. Weights were post-stratified by age and gender to reflect the census distribution. Prevalence estimates by period were computed with and without income and education standardisation; however, there were no differences by period so the data are presented without standardisation. Medians and prevalence rates were calculated using SPSS (SPSS version 21, IBM, Chicago Illinois, USA). Changes in the median and distribution of steps/day between 2005–06 and 2012–14 were tested by independent sample medians and Kruskal–Wallis tests, respectively. The significance of secular trends in achieving the sufficient activity step/day criterion or averaging below the <7000 step/day threshold was tested using the Rao–Scott adjusted χ^2 test of independence in the complex samples tabulate procedure.

Results

Overall, 22,132 boys and 21,674 girls (43,806 children/adolescents) participated in CANPLAY over the eight independent study periods. On average, about 5500 children participated during each survey within the entire surveillance period, however this ranged from 3883 in 2011–12 (due to funding constraints, which reduced sample size and limited follow-up) to 6627 in 2006–07. Although participation was roughly equal amongst boys and girls, a higher percentage of participants were younger (5–10 years), came from higher socio-economic (SES) households, defined by relatively higher parental education and household income level, and had parents who self-rated themselves as being just as active or more physically active than other adults of the same age and gender. (See Table 1.)

Table 1
CANPLAY participant characteristics, 2005–06 to 2012–14.

		Total (n = 43,806)		Boys (n = 22,132)		Girls (n = 21,674)	
Child's age (%)	5–10 years	20,305	45%	10,286	45%	10,019	45%
	11–14 years	13,633	29%	6889	29%	6744	28%
	15–19 years	9862	26%	4953	26%	4909	27%
Parent's education (%)	Less than secondary	2492	5%	1213	5%	1279	5%
	Secondary	8130	18%	4014	17%	4116	19%
	College	13,815	33%	7034	33%	6781	32%
	University	18,699	44%	9516	45%	9183	44%
Household income (%)	<\$60,000	13,612	32%	6835	32%	6777	32%
	\$60,000–99,999	12,446	33%	6318	33%	6128	33%
	\geq \$100,000	12,917	35%	6526	35%	6391	35%
Parent's self-rated activity relative to their peers (%)	Substantially more active	7072	17%	3656	17%	3416	17%
	Slightly more active	12,559	29%	6357	29%	6202	29%
	Just as active	15,966	36%	7952	36%	8014	37%
	Slightly less active	6216	15%	3151	15%	3065	15%
	Substantially less active	1228	3%	625	3%	603	3%

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