Title
Relation Between Self-Recalled Childhood Physical Activity And Adult Physical Activity

Journal
Open Journal of Epidemiology, 3(4)

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Publication Date
2013-11-01

Peer reviewed

HHS Public Access
Author manuscript
Health Behav Policy Rev. Author manuscript; available in PMC 2015 October 30.

Published in final edited form as:
Health Behav Policy Rev. 2014 November ; 1(6): 472–483. doi:10.14485/HBPR.1.6.5.

Self-recalled Youth Physical Activity and Postmenopausal Cardiovascular Disease

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Abstract

Objectives—To evaluate the association between childhood physical activity and incident cardiovascular disease (CVD) during postmenopausal years.

Methods—Proportional hazards and logistic regression were used describe the association between self-reported childhood physical activity and CVD incidence and mortality in 36,741 postmenopausal women.

Results—Older women, African-Americans, or nondrinkers or past drinkers self-reported the highest levels of youth physical activity and women with a history of diabetes, hypertension, overweight or obesity, or current smoking reported the highest youth physical activity dose. Youth physical activity was not associated with CVD incidence (HR=1.11; 0.93, 1.34) or mortality (HR=1.2; 0.9, 1.73).

Conclusions—Self-reported youth activity was not associated with postmenopausal CVD incidence or mortality.

Keywords

cardiovascular disease prevention; epidemiology; exercise; population studies

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Cardiovascular disease (CVD) is the leading cause of death in the United States, accounting for more than 700,000 deaths per year.[1] Physical activity as an adult has been shown to play a significant role in the primary prevention of CVD morbidity and mortality, with increasing levels of activity reducing the risk by 28–58%.[2] A dose-response association between greater physical activity in adulthood and reduced CVD risk has been observed in several studies,[3–7] and a recent meta-analysis of prospective studies found a 20–30 % reduction in incident CVD with high leisure physical activity levels.[8] The lower age limit for this cardiovascular protective effect of physical activity, however, is unknown. Some previous studies have found an association between childhood physical activity and several CVD risk factors in children, including blood pressure, lipids and body mass index (BMI),[9–11]

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Human Subjects Approval Statement
Written informed consent was obtained from all study participants. Procedures and protocols were approved by institutional review boards at all participating institutions.

although one prospective study of children aged 13–16 years found no association between their physical activity during adolescence and their CVD risk profile at age 32 years.[12] Additionally, a prospective study found that women who reported vigorous physical activity during high school were more likely to be active adults than those who reported no physical activity during high school; yet, physical activity during their teenage years was not predictive of adult CVD incidence.[13] Several childhood lifestyle and clinical factors, including family socioeconomic status, body mass index, blood pressure, LCL-cholesterol, and parental smoking, were associated with adult predictors of adult cardiovascular health 19–31 years later.[14] Few studies on childhood physical activity have explored the physical activity-CVD association for age groups under 9 years of age and no studies have evaluated the long-term impact of childhood physical activity on CVD risk in postmenopausal women.

The Women's Health Initiative Observational Study (WHI-OS), a large, multi-center prospective cohort study of postmenopausal women, provides an opportunity to examine these questions in postmenopausal women because of its large sample size, data on self-reported levels of childhood physical activity, including self-recalled data for age groups queried, i.e. 5–9, 10–14, and 15–19, and long-term follow-up of CVD outcomes. While the use of self-recalled childhood physical activity measurement provides access to data that would not be otherwise available, sources of potential biases, including recall and response bias must be addressed when interpreting the results. The present study examined the association between self-recalled levels of physical activity across three childhood age intervals (5–9 years, 10–14 years, and 15–19 years), and risks of primary CVD incidence and mortality in a group of 36,741 postmenopausal, ethnically diverse women from the WHI-OS cohort.

METHODS

The Women's Health Initiative Observational Study (WHI-OS) recruited postmenopausal women ages 50–79 years from 40 clinical centers between 1993 and 1998 to be followed for the development of the most common causes of death, including cardiovascular disease. Women were excluded from the WHI-OS if they had an existing medical condition with a survival time of less than 3 years, if they had characteristics that may affect study participation (e.g., alcoholism, drug dependency, mental illness, dementia), or if they were active participants in another randomized controlled clinical trial. Details of the design of the study, as well as the baseline measures and their reliability, have been published previously.[15–17]

At study enrollment, self-administered questionnaires collected information on participant demographics, medical, reproductive, and family histories and lifestyle factors including smoking history and alcohol consumption. Adult height and weight were measured at the baseline visit and body mass index (BMI), calculated as measured weight in kilograms divided by the square of height in meters, was used as an estimate of obesity status. An optimism score was calculated using a 6-item scale, the Life Orientation Test-Revised,[18] with total scores ranging from 6 to 30 and higher scores indicating greater optimism. A cynical hostility score was calculated by adding the response values of the 13-item cynicism subscale of the Cook-Medley Questionnaire[19], with higher scores indicating greater cynical hostility. Both optimism and cynical hostility have previously been shown to be associated with and physical activity level[20] and coronary heart disease in this cohort[21] A Social Support Index score was measured by adding the response values of 9 items from the Medical Outcomes Study.[22] Social ties have been shown to be positively associated with frequency of physical activity.[23]

Physical Activity Assessment

Childhood physical activity data was collected at the Year 3 post-baseline visit. WHI-OS participants were asked to recall the number of days per week they participated in strenuous physical activity at three age groups, 5–9 years, 10–14 years and 15–19 years for at least 20 minutes per day. Assessment of the reliability of long-term recall of leisurely physical activity has demonstrated significant correlations between actual baseline and recalled physical activity ranging from 0.39–0.62 among elderly, postmenopausal women.[24–26] It has been shown that among older women, 43.9% consistently recall or and 48.7% overestimate physical activity after a 30 year follow-up.[26] For this current study, information on usual physical activity during adulthood was collected at baseline. Women were asked how often (none, 1, 2, 3, 5, or 5 or more days per week) they walked outside the home for 10 minutes or more without stopping and how often they exercised in three intensity-specific levels of activity: strenuous or very hard exercise, moderate exercise, and mild exercise, for which examples of like activities were given to cue participant recall. Women were also asked the duration spent at each of these activity levels (less than 20 minutes, 20–39 minutes, 40–59 minutes, 1 hour or more). Adult physical activity levels at baseline were summarized as weekly energy expenditure [metabolic equivalent (MET) hours per week; MET-hr/wk] calculated by multiplying the number of hours per week by the MET intensity value of the activity and adding all types of activities.[27] The reliability[28] and validity[29] of the WHI physical activity questionnaire have been demonstrated elsewhere.

Childhood physical activity was evaluated in two ways. First, a cumulative youth activity dose (YAD) over the three age periods (5–9 years, 10–14, years, and 15–19 years) was calculated by multiplying recalled number of days per week of strenuous activity for each age grouping by the number of years in each age grouping (5 years for each) and then summing across all three age groupings (days/week × years). Participants could indicate participation in strenuous activity for 0, 1, 2, 3, 4, 5–7 days in each age grouping; 5–7 days were counted as 5 days in the calculation of the youth activity dose variable. In addition, childhood physical activity recalled at ages 5–9, 10–14, and 15–19 years was categorized into three levels; no-low physical activity (0–1 days/week), moderate physical activity (2–3 days/week) and high physical activity (≥ 4 days/week). Longitudinal childhood physical activity profiles were used to measure change in physical activity over the three age intervals and were defined as 1) always inactive (no-low physical activity reported for all three childhood age intervals); 2) always moderately active (physical activity reported as moderate for all three childhood age intervals); 3) always highly active (physical activity reported as high for all three childhood age intervals); 4) increased (reported physical activity changed from no-low physical activity to moderate or moderate to high as subject progressed from younger to older age groups); 5) decreased (reported physical activity changed from high to moderate or no-low physical activity as subject progressed from younger to older age groups); or 6) fluctuated as there was not a linear or consistent pattern to reported physical activity across the three age groups. These categorizations of childhood physical activity levels have been used previously to demonstrate an association between self-reported childhood physical activity and adult physical activity in the WHI cohort, and that variation of this association varied by multiple factors including race/ethnicity, smoking status, and BMI, and history of cardiovascular disease and diabetes.[30] Adult physical activity at baseline was categorized by quartiles of total weekly energy expenditure (0 MET-hrs/wk, 0–3 MET-hrs/wk, 3–9 MET-hrs/wk, and 9+ MET-hrs/wk) that have been used previously in the WHI-OS cohort.[31]

Ascertainment of Outcomes

Incident primary CVD cases, including coronary heart disease (nonfatal myocardial infarction or death from coronary causes) and total cardiovascular events (myocardial infarction, death from coronary causes, coronary revascularization, angina, congestive heart failure, stroke, or carotid revascularization), were centrally adjudicated using standardized case definitions and clinical criteria and updated annually through December 3, 2010.[32, 33] For the CVD endpoints myocardial infarction, stroke and coronary revascularization, good agreement has been shown in the WHI population between the sources of cases, including hospital discharge codes, self-report and review by study physicians (kappa = 0.64–0.92).[34] CVD mortality was determined through annual follow-up of participants or surrogates. Death certificate and medical record reviews were used to determine cause of death. A 94% rate of agreement between local and central clinical adjudicators as to cause of death has been shown.[33]

A total of 93,676 women enrolled in the observational study arm of the WHI.[34] The current analysis first excluded 2,578 women who either experienced incident CVD, died, or were lost to follow-up prior to the Year 3 visit, when the youth activity data were collected. Of the remaining 91,098 participants, 18,811 were excluded for prevalent CVD or missing CVD data at baseline, and 28,582 were missing physical activity data from any childhood age group. Of the remaining 43,705 eligible for the present analyses, 6,964 participants were excluded due to missing data for key confounding variables, leaving an analytic cohort of 36,741, who were younger, more likely to have a college degree, more prone to being former or nonsmokers, or consume alcohol, and more likely be white, currently use hormone therapy, or have relatives with CVD than the women who were excluded due to missing exposure or covariate(s) data.

There were two outcomes of interest. They were time from study entry to CVD and an indicator for CVD-related death during the study period. For the former, participants who remained event free or who died from a non-CVD-related cause were censored at the end of their participation in the main WHI Study.

Statistical Analysis

Baseline characteristics of the study population, including the distribution of potential confounders, were evaluated for differences across youth activity levels using Chi-squared tests for categorical data and ANOVA for continuous variables. Cox proportional hazards regression was used to estimate the unadjusted, partially-adjusted, and fully-adjusted hazard ratios (HR) and corresponding 95% confidence intervals (CI) in order to describe the association between both youth physical activity dose and youth physical activity profile and postmenopausal CVD incidence. Logistic regression was used to describe the association between youth physical activity and CVD-related mortality, as the proportional hazards assumption did not hold when modeling the hazard of CVD-related mortality as a function of youth activity. All confounders were chosen a priori and included age, education, race/ethnicity, alcohol intake, smoking history, baseline hormone use, family history of CVD, physical functioning, social support, systolic and diastolic blood pressure, history of diabetes, baseline physical activity, and constructs for adult optimism and pessimism.[35, 36] To access potential effect modification by baseline physical activity level, an interaction term was fit for baseline adult physical activity level and childhood physical activity level. Proportional hazards assumptions were graphically assessed using Kaplan-Meier plots. Analyses were performed using Statistical Analysis System software (SAS Institute, Inc., Cary, North Carolina) or R (R Foundation for Statistical Computing, Vienna, Austria). All statistical tests were two-sided and conducted at the 0.05 level of significance.

RESULTS

In this cohort of postmenopausal women, there were 913 non-fatal incident CVD events (2.48%) and 314 CVD deaths (0.85%) during an average follow-up of 8.1 years (range, 3–10 years). The age at baseline of the women ranged from 50 to 80 years with a mean of 62.5 years (SD=7.2 years). The racial/ethnic distribution of the population was 86.8% non-Hispanic white, 5.9% non-Hispanic black, 3.2% Hispanic/Latino, 2.7% Asian or Pacific Islander, and 0.3% American Indian.

The majority of participants (64.5%) reported a dose of youth physical activity in the highest category. The distribution of participant characteristics by youth physical activity dose is shown in Table 1. Statistically significant differences in several adult characteristics at baseline were seen across levels of youth physical activity dose. Older women, African-Americans, nondrinkers, past drinkers, or those who reported consuming less than one drink per month, those who graduated from high school but not college, current smokers, the overweight or obese, those with a history of diabetes, those with a history of hormone therapy use, those with a systolic blood pressure greater than 120 mmHg or those with a diastolic blood pressure greater than 90 mmHg were more likely to report the highest youth physical activity dose level. Women who were Hispanic/Latino, Asian/pacific Islanders, didn’t graduate from high school education, never smoked or used postmenopausal hormones, never consumed 7 or more drinks per week, were normal or underweight at baseline, or had a diastolic blood pressure ≤ 90 mmHg were more likely to report the lowest youth physical activity dose level. No association was seen between youth physical activity dose and family history of CVD. Women who reported the highest youth activity dose had a significantly greater baseline BMI, were more optimistic, but also had a greater cynical hostility index (Table 2). Higher youth activity was also associated with a lower level of baseline physical functioning. No association was seen between youth physical activity dose and use of diabetes medications at baseline. Continuous baseline BMI was significantly different between physical activity groups, and the high activity group had the highest mean

BMI. Physical activity groups were significantly different in social support, optimism, pessimism, and physical functioning. The high activity group was more optimistic, but was, perhaps paradoxically, also more cynical and hostile. No association was seen between youth physical activity dose and baseline social support.

In this cohort, the majority of women (55.4%) reported the highest level of adult physical activity (≥9 MET-h/hr) at baseline. Women who reported no adult physical activity at baseline were more likely to report the lowest youth activity dose.

As shown in Figure 1, in the unadjusted analysis, a high youth activity dose was directly associated with CVD incidence (HR=1.24; 1.03, 1.49)). This association, however, did not remain significant after adjustment for confounders (HR=1.11; 0.93, 1.34). As the interaction between adult and youth physical activity was not statistically significant, the association between youth activity and outcome is reported assuming homogeneity across levels of adult physical activity.

Women who reported a continuously high level of physical activity during each of the your age groups were significantly more likely to have an incident CVD event compared to women who reported physical inactivity at each youth age group (unadjusted HR=1.29; 1.05, 1.60) (Table 3). This association, however, was not significant after partial adjustment for confounding variables (partially-adjusted HR=1.16; 0.94, 1.43)) or full adjustment (fully-adjusted HR=1.17; 0.94, 1.44)). No association was seen between risk of CVD mortality by youth activity dose (Figure 2) or youth physical activity pattern (Table 4) in either the adjusted or unadjusted models. As in the incidence models, the interaction between adult and youth physical activity was not statistically significant.

DISCUSSION

In this cohort of 36,741 women, self-recalled youth physical activity level varied by participant demographic characteristics and was positively associated with several CVD risk factors; however, it was not associated with the risk of postmenopausal CVD morbidity or mortality. Consistent with other epidemiologic studies,[37] older age at baseline, high school education, and African-American race was associated with an increased level of physical activity during youth. Similarly, youth physical activity was associated with adult CVD risk factors, including current smoking at baseline, adult BMI, systolic and diastolic blood pressure, a history of diabetes, and cynical hostility. In addition, past hormone therapy, past or never drinking, or alcohol less than once per month was also associated with higher youth physical activity level. Previous cross-sectional studies investigating the association between childhood physical activity and CVD risk factors, including blood pressure, lipids, and obesity have shown mixed results[14, 38–42]. While some have shown an inverse association between youth physical activity and blood pressure, total cholesterol, LDL-C, or a CVD risk index,[38–40] others have not found a relationship.[14, 41, 42] Prospectively, the Danish Youth and Sports Study found a weak direct association between changes in physical fitness, as measured by VO_2max, in adolescent girls and changes in CVD risk profiles eight years later[43] and the recent prospective Cardiovascular Risk in Young Finns study found that childhood physical activity decreased CVD risk factor status over the 30 year follow-up.[44]

Two physical activity intervention trials in children have shown inconsistent effects on blood pressure and lipids.[45, 46]

Fatty streaks, an indication of early atherosclerotic formation, have been demonstrated in the coronary arteries of children and young adolescence, and nutrition and adiposity during youth have been shown to be associated with arterial elasticity and carotid intima media thickness,[47] suggesting that CVD development begins early in life.[48–50] Others have also shown an inverse association between a combined childhood cardiovascular health index and adult carotid intima media thickness (51). Consistent with studies in older adolescents,[12, 13] however, this study did not demonstrate an association between physical activity level during childhood and the risk of postmenopausal CVD morbidity or mortality. To our knowledge, this is the first study to examine the relation between recalled physical activity during this early childhood period and the risk of incident postmenopausal CVD and CVD mortality.

The self-recalled nature of the exposure variable introduces potential limitations to this study. Youth physical activity data was collected, on average, about 56 years after exposure, and it is possible that recall bias may account for this lack of association between childhood physical activity and postmenopausal CVD incidence and mortality. It has previously been shown that long term recall of physical activity by older women is most likely consistent or overestimated,[26] and a true protective effect of childhood physical activity on incident postmenopausal CVD may be diminished or obscured by erroneously diminishing the incidence among the exposed group. In addition, if childhood inactivity increases the risk of pre-menopausal CVD, it is possible that selection bias could have obscured a cardio-protective effect. It is also possible that baseline adult BMI, physical activity level, or prevalence of CVD risk factors may differentially influence youth physical activity recall resulting in a response or social desirability bias, weakening a possible association. However, we have previously shown in this cohort that self-recalled childhood physical activity level varies significantly, as expected, by several participant baseline adult characteristics including race/ethnicity, education, smoking history, adult BMI, adult WHR, history of diabetes or cardiovascular disease, adult social support and physical functional status.[30] Although the type and amount of physical activity has changed over the past 50 years, physical activity during childhood has been shown to predict physical activity during the adult years,[13, 52] and 56% of women in the study population who reported the highest levels of childhood activity were likely to also report 9+ MET-h/wk at baseline. An additional concern is that 60.8% of the WHI-OS participants were excluded from this study due to baseline disease or missing data. The impact of the missingness was evaluated, however, by comparing the analytic and excluded cohorts. These differences were found to be small and unlikely to bias our estimates. Also, while unavailability of the youth physical activity variable was a large cause for exclusion, it is unlikely that the ability to recall physical activity for the childhood and adolescence period is correlated with CVD in the postmenopausal period. In addition, women with a history of CVD at baseline were excluded from this study and the exposure variable was collected prior to the onset of disease. It has been proposed that childhood weight, independent childhood physical activity, may be associated with risk of adult CVD and it has been shown that childhood adiposity predicts adult intima-media thickness.[53] Although the current study controlled for adult BMI, a factor highly correlated with childhood BMI,[44] childhood height and weight are not available. Previous studies, however, have not demonstrated an association between childhood BMI and CVD morbidity/mortality, independent of adult BMI.[54–56] Because baseline CVD was not documented by cardiac catheterization or similar procedures, it is possible that some women with existing disease were not excluded from the study population, thereby potentially diminishing a possible association between childhood physical activity and incident CVD or mortality. This is unlikely however, since these criteria to determine baseline and incident CVD have successfully demonstrated significant associations between an array of exposures and incident CVD in the WHI cohort.[57–62] Finally, it has been suggested that current, not past physical activity levels, are most relevant to cardiovascular health.[12]

Although this observational study did not demonstrate a direct role of early childhood physical activity in the primary prevention of postmenopausal CVD incidence and mortality, additional long-term prospective studies are needed. This study evaluated the impact of youth physical activity as measured by self-recall. Direct measurement of the youth physical activity exposure is critical to further evaluate and quantitate the effects of early childhood and adolescent physical activity level on CVD risk in older women.

IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

While a protective role of adult physical activity and incident CVD is well established, the lower age of physical activity exposure has not been previously examined. It is possible that early childhood physical activity may directly reduce the risk of CVD in later adulthood. Alternatively, this study has shown that adults who reported the highest level of adult physical activity were more likely to report the highest level of childhood physical activity and sedentary adults were more likely to be physically inactive children. It is possible there is an indirect benefit of childhood physical activity, by teaching the life-long habit of exercising. Further studies are necessary to enable improved recommendations in the primary prevention of CVD.

Acknowledgments

The WHI program is funded by the National Heart, Lung, and Blood Institute, National Institutes of Health, U.S. Department of Health and Human Services through contracts HHSN268201100046C, HHSN268201100001C, HHSN268201100002C, HHSN268201100003C, HHSN268201100004C, and HHSN271201100004C

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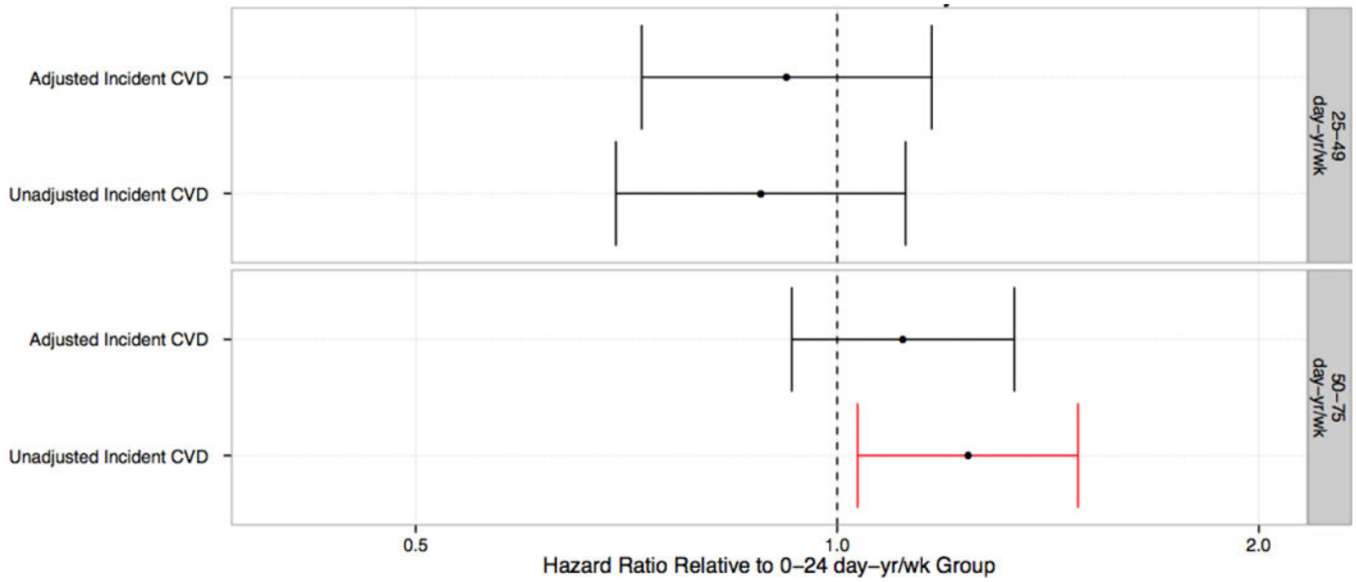

Figure 1. Unadjusted and Adjusted* Cardiovascular Disease (CVD) Incidence Hazard Ratio (HR) and 95% Confidence Interval (CI) Estimates by Youth Activity Dose

*Fully adjusted model included age, race, education, alcohol consumption, smoking status, baseline adult physical activity level, diastolic blood pressure, systolic blood pressure, diabetes history, baseline adult BMI, family history of CVD, baseline hormone use status, optimism construct, pessimism construct, physical functioning, and social support construct.

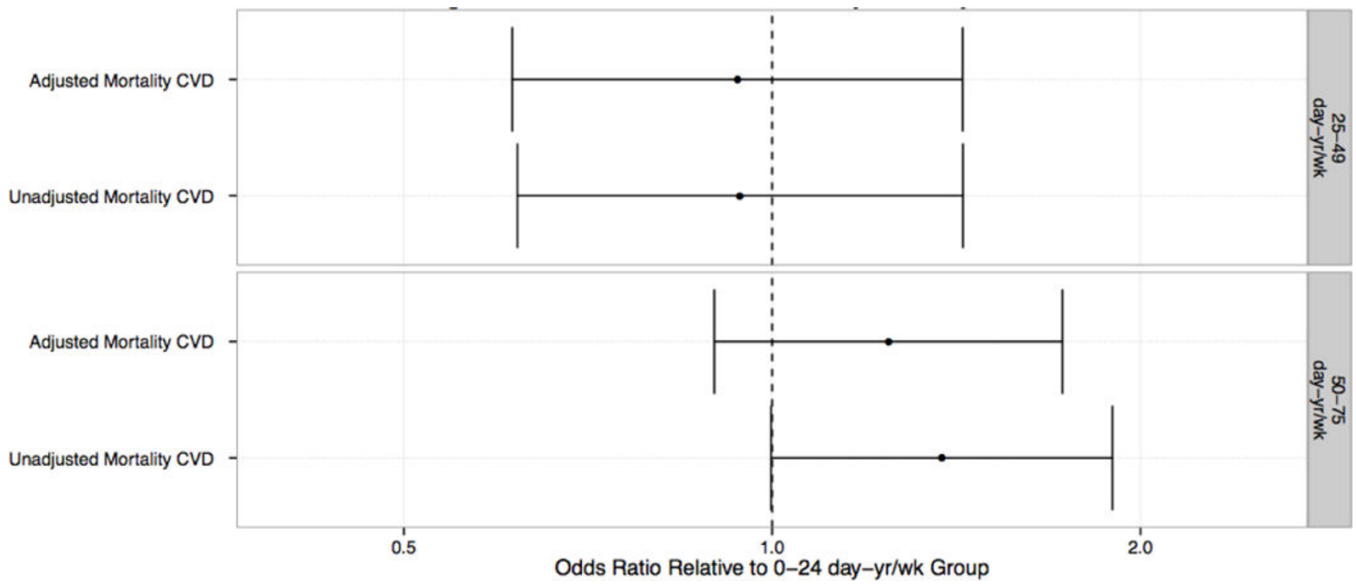

Figure 2. Unadjusted And Adjusted* Cardiovascular Disease Mortality Odd Ratio (OR) And 95% Confidence Interval (CI) Estimates By Youth Activity Dose

*Fully adjusted model included age, race, education, alcohol consumption, smoking status, baseline adult physical activity level, diastolic blood pressure, systolic blood pressure, diabetes history, baseline adult BMI, family history of CVD, baseline hormone use status, optimism construct, pessimism construct, physical functioning, and social support construct.

Table 1

Distribution of Sample Characteristics by Youth Activity Dose

	(YAD) Youth Activity Dose (days-yr/wk)				
	Total N (%)	**Low (0–24)**	**Moderate (25–49)**	**High (50–75)**	**p-value**
N	36741	6475	6572	23694	
Baseline Adult Age (years)					0.002
50 to 54	5828 (15.9%)	16.7%	17.6%	15.2%	
55 to 59	7766 (21.1%)	21.3%	21.1%	21.1%	
60 to 69	16028 (43.6%)	43.2%	42.5%	44.0%	
70 to 79	7119 (19.4%)	18.9%	18.8%	19.7%	
Race					< 0.001
White (not of Hispanic origin)	31908 (86.8%)	85.9%	87.8%	86.8%	
Black or African-American	2174 (5.9%)	4.8%	4.5%	6.6%	
Hispanic/Latino	1181 (3.2%)	3.7%	3.2%	3.1%	
Asian or Pacific Islander	996 (2.7%)	4.6%	3.0%	2.1%	
American Indian or Alaskan Native	118 (0.3%)	0.2%	0.4%	0.3%	
Other	364 (1.0%)	0.9%	1.2%	1.0%	
Education					< 0.001
Less than High School Diploma	1133 (3.1%)	4.0%	2.7%	2.9%	
High School Diploma	18157 (49.4%)	46.7%	46.9%	50.8%	
College Degree	17451 (47.5%)	49.3%	50.4%	46.2%	
Baseline BMI (kg/m^2)					< 0.001
0–18.4	403 (1.1%)	1.5%	1.2%	0.9%	
18.5–24.9	15471 (42.1%)	47.5%	46.5%	39.4%	
25–29.5	12471 (33.9%)	32.8%	33.2%	34.5%	
30+	8396 (22.9%)	18.1%	19.1%	25.2%	

	(YAD) Youth Activity Dose (days-yr/wk)				
	Total N (%)	**Low (0–24)**	**Moderate (25–49)**	**High (50–75)**	**p-value**
Alcohol Consumption					< 0.001
Non drinker	9.9%	9.9%	9.3%	10.0%	
Past drinker	16.6%	15.0%	14.5%	17.6%	
< 1 drink per month	11.5%	11.0%	11.0%	11.7%	
< 1 drink per week	20.6%	21.2%	21.5%	20.2%	
1 to < 7 drinks per week	27.8%	28.4%	29.9%	27.0%	
7+ drinks per week	13.7%	14.4%	13.8%	13.5%	
Smoking History					< 0.001
Never Smoked	51.6%	54.7%	51.8%	50.7%	
Past Smoker	42.6%	40.8%	43.4%	42.9%	
Current Smoker	5.8%	4.6%	4.9%	6.3%	
History of Diabetes					< 0.001
Yes	4.0%	3.3%	3.4%	4.3%	
No	96.0%	96.7%	96.6%	95.7%	
Family History of Heart Disease					0.166
Yes	68.6%	67.1%	67.2%	69.4%	
No	31.4%	32.9%	32.8%	30.6%	
Hormone Use History					< 0.001
Never used hormones	28.2%	30.0%	27.3%	27.9%	
Past hormone user	19.3%	18.3%	19.2%	19.6%	
Current hormone user	52.5%	51.7%	53.5%	52.5%	
Diastolic Blood Pressure (mmHg)					0.029
< = 90	95.9%	96.4%	96.2%	95.7%	

	(YAD) Youth Activity Dose (days-yr/wk)				
	Total N (%)	**Low (0–24)**	**Moderate (25–49)**	**High (50–75)**	**p-value**
> 90	4.1%	3.6%	3.8%	4.3%	
Systolic Blood Pressure (mmHg)					<0.001
< 120	43.4%	45.5%	46.3%	42.1%	
120–140	39.0%	38.1%	37.3%	39.6%	
> 140	17.6%	16.4%	16.4%	18.3%	

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Table 2

Sample Adult Baseline Characteristics by Youth Activity Dose (YAD)

	Youth activity dose (YAD)			
	Low (0–24 day-yr/wk)	**Moderate (25–49 day-yr/wk)**	**High (50–75 day-yr/wk)**	**p-value**
BMI (mean (SD))	26.11 (5.24)	26.34 (5.21)	27.32 (5.83)	<0.001
Social Support Index (mean (SD))	36.55 (7.64)	36.44 (7.38)	36.56 (7.53)	0.185
Optimism Score (mean (SD))	23.29 (3.57)	23.47 (3.38)	23.79 (3.39)	<0.001
Pessimism Score (mean (SD))	3.43 (2.8)	3.4 (2.72)	3.52 (2.72)	<0.001
Physical Functioning Index (mean (SD))	85.64 (17.13)	85.41 (16.79)	83.68 (18.6)	<0.001
Baseline Physical Activity (%)				
0 MET-h/wk	13.5%	10.9%	11.5%	
0–3 MET-h/wk	9.9%	10.7%	10.9%	
3–9 MET-h/wk	22.8%	23.6%	21.6%	
9+ MET-h/wk	53.8%	54.7%	56.0%	

Table 3

Unadjusted And Adjusted* Cardiovascular Disease (CVD) Incidence Hazard Ratio (HR) And 95% Confidence Interval (CI) Estimates By Longitudinal Youth Physical Activity Pattern

Longitudinal Youth Physical Activity Pattern	Unadjusted HR (95% CI)	Partially Adjusted HR (95% CI)	Fully Adjusted HR (95% CI)	p-value
Always Inactive	Reference	Reference.	Reference	0.11
Always High Activity	1.29 (1.05, 1.6)	1.16 (0.94, 1.43)	1.17 (0.94, 1.44)	
Always Low Activity	0.76 (0.54, 1.08)	0.86 (0.61, 1.22)	0.86 (0.61, 1.22)	
Decrease	0.74 (0.56, 0.98)	0.90 (0.69, 1.19)	0.9 (0.68, 1.19)	
Fluctuate	1.05 (0.68, 1.62)	1.14 (0.74, 1.77)	1.15 (0.74, 1.77)	
Increase	1.19 (0.93, 1.52)	1.10 (0.86, 1.40)	1.1 (0.86, 1.4)	

* Fully adjusted model included age, race, education, alcohol consumption, smoking status, baseline adult physical activity level, diastolic blood pressure, systolic blood pressure, diabetes history, baseline adult BMI, family history of CVD, baseline hormone use status, optimism construct, pessimism construct, physical functioning, and social support construct.

** Partially adjusted model included all covariates from the fully adjusted model, except baseline physical activity

Table 4

Unadjusted And Adjusted* Cardiovascular Disease Mortality Odds Ratio (OR) And 95% Confidence Interval (CI) Estimates By Longitudinal Youth Physical Activity Pattern

Longitudinal Youth Physical Activity Pattern	Unadjusted OR (95% CI)	Partially Adjusted OR (95% CI)	Fully Adjusted OR (95% CI)	p-value
Always Inactive	Reference	Reference	Reference	0.41
Always High Activity	1.34 (0.94, 1.92)	1.21 (0.84, 1.74)	1.21 (0.84, 1.75)	
Always Low Activity	0.74 (0.41, 1.36)	0.79 (0.43, 1.45)	0.79 (0.43, 1.46)	
Decrease	0.79 (0.49, 1.25)	0.97 (0.61, 1.56)	0.98 (0.61, 1.57)	
Fluctuate	1.09 (0.53, 2.27)	1.08 (0.51, 2.25)	1.08 (0.52, 2.27)	
Increase	1.03 (0.67, 1.58)	0.93 (0.61, 1.44)	0.94 (0.61, 1.45)	

* Fully adjusted model included age, race, education, alcohol consumption, smoking status, baseline adult physical activity level, diastolic blood pressure, systolic blood pressure, diabetes history, baseline adult BMI, family history of CVD, baseline hormone use status, optimism construct, pessimism construct, physical functioning, and social support construct.

** Partially adjusted model included all covariates from the fully adjusted model, except baseline physical activity