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Vigorous Physical Activity Among College Students in the United States

Toben F. Nelson, Steven L. Gortmaker, S. V. Subramanian, and Henry Wechsler

Background: Vigorous physical activity (VPA) declines from adolescence into adulthood, and social disparities in VPA exist. Physical activity is understudied in the college setting. ***Methods:*** VPA during high school and college was examined among 10,437 students attending 119 four-year colleges using gender-stratified logistic regression analyses. ***Results:*** Fewer students engaged in VPA in college compared with high school (males 74% to 52%; females 68% to 44%). Athletics was associated with VPA, but 51% participated in high school and 15% in college. Among females, African Americans, Asians, and students of lower socioeconomic position (SEP) were less likely to engage in VPA in college, adjusting for high school VPA. Among males, Asians and older students were less likely to engage in VPA. ***Conclusions:*** VPA declines from high school to college. Athletic participation is a determinant of VPA, but few participate in collegiate athletics. Social disparities in VPA emerge in college, an important setting for promoting VPA and addressing health disparities.

Key Words: emerging adulthood, health disparities, athletics

Regular physical activity is an important contributor to human health. It is positively associated with longevity and may prevent or help manage diabetes, metabolic syndrome, overweight, hypertension, cardiovascular disease, and colon cancer.[1-8] Among children and adolescents, lack of physical activity is associated with higher body mass index.[9,10] Physical activity is also associated with positive mood, self-esteem, and decreased anxiety.[11-14]

Healthy adolescents and adults should engage in moderate-intensity activity for 30 minutes or more on at least 5 days of the week or vigorous physical activity (VPA) for 20 minutes or more on at least 3 days of the week.[15] About 3 in 5 (62.6%) high school students nationally (70.0% of males and 55.0% of females) engage in recommended levels of VPA, although these rates are lower in higher grades. Adults are less active than adolescents. Overall, only about 1 in 4 adults in

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the United States meet the minimum recommendations for VPA.[8, 16, 17] Young adults ages 18 to 24 years had the highest rate of compliance with recommended levels of VPA (39.6%), but the rates were lower in each older age grouping.[18, 19]

Social inequalities in VPA exist by gender, race/ethnicity, and socioeconomic position (SEP). Men tend to engage in VPA at higher rates than females.[17, 20] Some minority racial/ethnic groups report lower rates of VPA than whites, and gradients in VPA and inactivity exist by level of education and by household income.[19, 21-24] Racial and socioeconomic inequalities in VPA may contribute to poorer health outcomes for these groups.[25]

Healthy People 2010 goals call for an increase in VPA among adults from 23% to 30% and among adolescents from 65% to 85% and aim to decrease social disparities in rates of physical activity.[26] However, little progress nationwide has been achieved toward these goals.[17]

A major challenge to promoting physical activity is maintaining activity levels over time among those who are already active.[16, 18] Late adolescence and early adulthood is one period of declining activity, although the tracking of physical activity during this period remains understudied.[27] Approximately 10 million young people, or nearly one-third of all young adults in the United States, attend college.[28] This shared experience during an important developmental transition suggests that college could be an important setting for understanding and promoting physical activity. However, few studies have examined the impact of this transition on physical activity. One study at a single college in Canada examined VPA from high school to college and found that while 2 in 3 were active in high school, fewer than half (44.1%) met the recommended levels of activity during college. Among these students, one-third were active in high school but inactive in college, while only 11% actually became active in college.[29] Due to small sample size, these authors were unable to examine potential differences in activity by gender or other sociodemographic subgroups.

One important change that occurs in the transition from high school to college and may impact activity is the decreased opportunity in college to participate in organized sporting activities.[30] Organized sport activities form an important opportunity for both adolescents and adults to engage in activity.[27, 31, 32] The competitive nature of intercollegiate athletics reduces the opportunity for many students to participate in athletics in college, and this may influence VPA.

Declines in VPA may also occur at a greater rate among student subgroups by race/ethnicity and SEP. One longitudinal study found that declines in physical activity during adolescence were greater among African American girls than white girls,[33] although evidence from another longitudinal study found that African American females were more likely than white females to maintain recommended levels of activity from adolescence into adulthood.[34] This question has not been addressed among the college student population.

This study examines the prevalence of VPA among students attending college by student subgroups using a large, nationally representative sample of college students. Differences in college VPA, and no VPA in college, were examined by gender, race/ethnicity, SEP, and year in school, and participation in organized athletics during high school and college, adjusting for high school activity.

Methods

Sample

Physical activity was studied using data from the 2001 Harvard School of Public Health (HSPH) College Alcohol Study (CAS), a nationally representative study of college students (N = 10,437) attending 4-year colleges in the United States (N = 119).[35] The study was reviewed and approved by Human Subjects Committee at the Harvard School of Public Health. The 2001 survey administration included questions about physical activity comparable to those used in other surveillance surveys.[16, 36] The overall response rate was 52% and ranged from 22% to 86% by college, and this variable was included as a college-level covariate in all analyses, consistent with other analyses of these data.[35] Analyses stratified on college response rate examined its potential influence on the findings, but results of these analyses were similar.

Measures

Vigorous physical activity (VPA) was assessed using the question: "Think back over the past 7 days. On how many days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, bicycling, or similar aerobic activities?" Response choices ranged from 0 to 7 days, similar to questions in other surveillance surveys.[16, 36, 37] Self-reported VPA is positively correlated with objective measurement[37-39] health and longevity1-8 and is recommended for large-scale surveillance.[37] A similarly worded question assessed usual VPA in the final year of high school and was asked subsequent to the current VPA question. Recalled physical activity can be reliably measured[40] and is associated with subsequent physical fitness.[41] Responses were transformed into dichotomous variables indicating either the recommended level of VPA (3 or more days per week) or inactivity (0 days per week) for each period, college and high school.

Student demographic variables of age, gender, race/ethnicity, and SEP were examined. Student age was assessed as current age in years (17 and under, 18, 19, 20, 21, 22, 23, 24, and 25 and older). Year in school was defined as freshmen (1st year), sophomore (2nd year), junior (3rd year), senior (4th year), 5th year undergraduate or beyond, and graduate student. Race/ethnicity response options were: white, black/African American, Asian/Pacific Islander, Native American Indian/Native Alaskan, Other, with a separate question assessing Hispanic or Spanish origin. The Native American and other race categories were combined due to small cell sizes for each. SEP was assessed using measures of parental educational attainment for each parent. A 3-level variable was constructed from these responses, with low SEP reflecting neither parent attended college; middle SEP as 1, but not both parents attended college; and high SEP was both parents attended college, consistent with previous analysis of these data.[42] Athletes were students who participated in 1 or more hours of intercollegiate athletics per day, consistent with previous analysis.[43] Participants in high school athletics who earned a varsity letter were considered high school athletes. Students with missing data on these

variables of interest were excluded from the analysis. Missing data occurred in less than 1% of the cases for each variable.

Consistent with previous analyses of these data, a weighting scheme matched the sample from each school to its true population over 8 strata by gender, 2 age groups (<22 versus others) and 2 ethnic groups (white vs. others) to help protect against bias through nonresponse.[35]

Analysis

The prevalence of VPA and inactivity was estimated for both current college activity and a typical week during high school and was further examined by subgroups of gender, race/ethnicity, SEP, and athlete status in 4 categories (never athlete, former athlete in high school, athlete in high school and college, athlete in college only).

A series of logistic regression models was estimated using the Generalized Estimating Equation method (GEE) and the GENMOD procedure in SAS.[44,45] GEE models provide robust standard errors and account for clustering in the data within colleges induced by the sampling scheme. Differences in high school VPA between student subgroups were explored. An initial model examined gender differences and subsequent analyses were stratified by gender (using the BY command in PROC GENMOD) to examine time-invariant individual characteristics (eg, race/ethnicity, SEP, and participation in high school athletics). This analysis was adjusted for age (as a continuous variable centered on age 18 and a binary variable of age 25 years and above, with age 18 as a referent) and year in school (as a continuous variable centered on the first year) to account for potential recall bias. A second set of models explored VPA in college as an outcome with the same predictors mentioned above, as well as participation in collegiate athletics, to examine differences in VPA during college. This model adjusted for high school VPA. Inactivity was examined as an outcome in a similar set of analyses. A final set of analyses examined VPA in college stratified by gender and participation in high school athletics and separately for gender and participation in collegiate athletics.

Results

Fewer than half of all college students in the United States (47.6%) met the recommended criteria for VPA, a sharp decline from the percentage of the same students who met the criteria while they were in high school (70.7%). Similarly, 1 in 4 students (23.2%) did not engage in any VPA, an increase from high school (13.2%). Patterns in VPA and inactivity are shown in Tables 1 and 2 by race/ethnicity, SEP, athletic participation, age, and year in school for both male and female students.

Females were less likely to engage in VPA during high school (Odds Ratio = 0.76, 95% Confidence Interval: 0.67, 0.86). The results of gender-stratified models for high school VPA and inactivity by student subgroups for race/ethnicity, SEP, and athletic participation are shown in Table 3. Half (50.6%) of college students participated in varsity high school athletics. Participated in high school athletics was associated with VPA in high school. Asian females were more likely to engage in recommended levels of VPA compared with white females. Students age 25 years and older were more likely to report VPA in high school for both males and females.

Table 1 Rates (%) of Meeting Criteria for Vigorous Physical Activity or Sedentary Behavior in High School and College by Demographic Characteristics and Stratified by Gender in a Nationally Representative Sample of College Students in the United States (n = 10,437)

	Male			Female		
		Met criteria for vigorous activity			Met criteria for vigorous activity	
	% of population	High school	College	% of population	High school	College
Overall	45	73.8	52.1	55	68.1	44.0
VPA in high school						
met criteria	74	100	59.4	68	100	50.1
did not meet criteria	26	0	31.2	32	0	30.9
Race/ethnicity						
White	72	75.1	53.1	71	69.6	47.2
African American	7	76.9	57.2	8	62.5	34.6
Asian	9	66.1	39.6	9	57.4	28.8
Native American/other	10	72.6	51.8	10	70.8	41.0
Hispanic	8	73.8	53.8	8	72.9	41.9
Socioeconomic position						
both parents attended college	63	74.8	53.8	60	70.1	47.7
only one parent attended college	23	71.3	49.9	24	66.5	40.5
neither parent attended college	15	73.5	47.9	17	63.1	35.4
Athletic participation						
college and high school	16	94.8	83.5	8	91.6	83.0
high school, no college	39	89.9	55.6	39	87.9	48.0
college only	5	74.7	63.4	2	63.4	64.9
no high school or college	40	49.7	34.7	51	49.2	33.4
Year in college						
1st	23	73.6	54.7	25	66.4	46.4
2nd	23	72.4	52.7	23	68.2	42.9
3rd	26	72.1	50.6	25	68.8	43.6
4th	20	75.0	51.0	22	69.2	44.0
5th	8	81.8	50.0	6	67.8	38.8
Age (y)						
<21	50	72.3	54.2	56	68.3	45.8
21-24	41	75.8	52.0	37	68.6	42.9
≥25	8	73.6	39.5	8	63.8	35.9

Table 2 Rates (%) of Inactivity in High School and College by Demographic Characteristics and Stratified by Gender in a Nationally Representative Sample of College Students in the United States (n = 10,437)

	Male			Female		
		Inactive in:			Inactive in:	
	% of population	High school	College	% of population	High school	College
Overall	45	10.7	19.3	55	15.2	26.4
Inactive in high school						
yes	11	100	49.7	15	100	48.2
no	89	0	15.6	85	0	22.5
Race/ethnicity						
White	72	10.7	18.9	71	13.8	22.8
African American	7	12.8	18.4	8	19.2	40.9
Asian	9	10.5	21.7	9	22.6	41.1
Native American/other	10	10.4	19.5	10	15.7	27.2
Hispanic	8	8.1	18.3	8	12.3	27.3
Socioeconomic position						
both parents attended college	63	10.3	18.3	60	14.0	23.8
only one parent attended college	23	10.8	19.6	24	15.9	28.5
neither parent attended college	15	12.3	22.6	17	18.7	33.0
Athletic participation						
high school and college	16	1.7	2.9	8	2.1	4.6
high school, no college	39	3.1	16.3	39	4.2	22.0
college only	5	7.1	4.3	2	8.5	7.4
no high school or college	40	22.1	30.5	51	26.2	34.4
Year in college						
1st	23	10.3	17.3	25	14.8	22.7
2nd	23	12.6	18.7	23	15.9	26.4
3rd	26	11.0	19.6	25	13.9	27.5
4th	20	9.3	21.7	22	15.4	28.1
5th	8	9.1	19.2	6	19.4	31.9
Age (y)						
<21	50	11.4	17.2	56	14.4	24.1
21-24	41	9.2	20.1	37	15.5	28.5
≥25	8	14.0	27.1	8	20.2	33.4

Table 3 Odds Ratios and 95% Confidence Intervals From Gender Stratified Marginal Logistic Regression Models Predicting Vigorous Physical Activity During High School in a Representative Sample of College Students in the United States (N = 10,437)

	Vigorous physical activity (≥3 d/wk)		Inactive (0 d/wk)	
	Males (n = 3748)	Females (n = 6689)	Males (n = 3748)	Females (n = 6689)
Race/ethnicity				
White	1.00	1.00	1.00	1.00
African American	1.12 (0.76, 1.64)	0.97 (0.77, 1.24)	1.20 (0.70, 2.06)	1.14 (0.85, 1.54)
Asian	1.07 (0.76, 1.52)	0.84 (0.71, 0.99)*	0.60 (0.39, 0.92)*	1.32 (1.02, 1.70)*
Native American/other	1.02 (0.66, 1.58)	1.13 (0.84, 1.52)	1.02 (0.61, 1.69)	1.26 (0.87, 1.83)
Hispanic	1.08 (0.67, 1.74)	1.47 (1.02, 2.13)*	0.57 (0.32, 1.00)§	0.56 (0.36, 0.88)*
Socioeconomic position				
both parents attended college	1.00	1.00	1.00	1.00
only one parent attended college	1.12 (0.85, 1.47)	0.92 (0.80, 1.05)	0.99 (0.71, 1.39)	1.05 (0.86, 1.27)
neither parent attended college	0.86 (0.69, 1.07)	0.85 (0.69, 1.05)	1.07 (0.76, 1.50)	1.15 (0.90, 1.46)
High school athletic participation				
athlete	9.80 (7.82, 12.30)†	8.05 (6.74, 9.67)†	0.10 (0.08, 0.15)†	0.12 (0.09, 0.15)†
nonathlete	1.00	1.00	1.00	1.00
Age (centered on 18 y)	1.06 (0.95, 1.18)	1.03 (0.96, 1.10)	0.98 (0.87, 1.10)	1.01 (0.93, 1.10)
Age 25 y or older (reference is 18 y)	1.51 (0.93, 2.45)§	1.41 (1.05, 1.90)*	1.09 (0.64, 1.88)	0.96 (0.70, 1.31)
Year in school (continuous centered on 1st year)	0.98 (0.87, 1.10)	1.04 (0.96, 1.13)	0.98 (0.85, 1.13)	0.99 (0.90, 1.10)
Response rate (continuous)	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	0.99 (0.98, 1.01)	1.00 (0.99, 1.01)

§$P < .10$; *$P < .05$; †$p < .001$.

Similar patterns were observed for inactivity (Table 3). Females were more likely to be inactive (OR = 1.49, 95% CI: 1.29, 1.72). In gender-stratified models, athletes were less likely to be inactive for both males and females. Small differences in the findings for inactivity among racial/ethnic groups emerged. Asian males were less likely to be inactive than white males, although Asian females were more likely to be inactive than white females. Hispanic male and females were less likely to be inactive than their white peers. No differences in high school inactivity were noted by age.

Different patterns across student subgroups emerged in college, as shown in Table 4. Adjusting for high school VPA, females were less likely than males to engage in VPA during college (OR = 0.75, 95% CI: 0.68, 0.83). Participation in collegiate athletics was associated with VPA during college for both males and females. Participation in high school, but not college athletics, also was associated with college VPA, although the strength of the relationship was not as strong. In gender-stratified analyses, Asian males were less likely to meet criteria for VPA than white males. Among females, Asians and African American students were less likely to meet VPA recommendations. Females of lower SEP were also less likely to engage in VPA. These findings did not vary with adjustment for high school VPA. Students age 25 y and older were less likely to engage in VPA during college after adjusting for their higher rates of VPA during high school. Similar patterns were found for inactivity (not shown, available on request from authors).

High school athletic participation was associated with college VPA. For males, 63.7% of high school athletes engaged in VPA in college, while 37.9% of high school nonathletes did so in college. Similarly among females, 54.2% of high school athletes engaged in VPA in college, while 34.8% of high school nonathletes engaged in VPA in college. VPA patterns in high school and college were similar for male and female athletes and nonathletes alike (results not shown). Those students who participated in collegiate athletics were also more likely to engage in VPA during college. Adjusting for participation in collegiate athletics, we observed consistent findings among male athletes and nonathletes of lower likelihood of engaging in VPA in college among Asian students and among those over the age of 25 years. Among females we also observed consistent findings between athletes and nonathletes. African American and Asian females were significantly less likely to engage in VPA in college, as were females of lower SEP. One difference among female students was for age. We observed a declining trend by age and a significantly lower likelihood of engaging in VPA in college for students over the age of 25 among female high school athletes that was not evident for females who were not athletes in high school. We tested the difference in parameter estimates in these independent groups using methods recommended by Altman and Bland.[46] The difference in the slope estimate for student age up to age 24 was not significantly different between athletes and nonathletes among female students ($z = 0.81$; P = not significant). However, we did observe a significant difference between female athletes and nonathletes in their VPA in college ($z = 3.75$; $P < .001$).

Students who participated in collegiate athletics were more likely to engage in VPA in college. For males, 78.7% of collegiate athletes engaged in VPA in college, compared with 45.0% of collegiate nonathletes. Among females, 79.1% of collegiate athletes engaged in VPA in college, compared with 39.7% of collegiate nonathletes. We stratified these analyses by collegiate athletic participation and

Table 4 Odds Ratios and 95% Confidence Intervals From Gender Stratified Marginal Logistic Regression Models Predicting Vigorous Physical Activity During College in a Representative Sample of College Students in the United States (N = 10,437)

	Males (n = 3748)		Females (n = 6689)	
VPA in high school				
met VPA criteria		2.09 (1.73, 2.52)†		1.67 (1.48, 1.89)†
did not meet criteria		1.00		1.00
Race/ethnicity				
White	1.00	1.00	1.00	1.00
African American	1.05 (0.74, 1.49)	1.04 (0.74, 1.47)	0.72 (0.58, 0.90)‡	0.72 (0.58, 0.90)‡
Asian	0.66 (0.48, 0.92)*	0.66 (0.48, 0.91)*	0.53 (0.39, 0.71)†	0.54 (0.40, 0.72)†
Native American/other	0.91 (0.62, 1.34)	0.91 (0.62, 1.35)	0.87 (0.68, 1.10)	0.85 (0.67, 1.08)
Hispanic	1.22 (0.80, 1.87)	1.22 (0.79, 1.90)	1.11 (0.84, 1.45)	1.07 (0.82, 1.39)
Socioeconomic position				
both parents attended college	1.00	1.00	1.00	1.00
only one parent attended college	0.92 (0.77, 1.10)	0.94 (0.78, 1.12)	0.81 (0.70, 0.93)‡	0.82 (0.71, 0.94)‡
neither parent attended college	0.94 (0.72, 1.21)	0.91 (0.71, 1.18)	0.69 (0.59, 0.82)†	0.71 (0.60, 0.84)†
Athletic participation				
high school and college	9.05 (6.48, 12.65)†	6.67 (4.77, 9.34)†	9.04 (6.90, 11.85)†	7.36 (5.59, 9.69)†
high school, no college	2.26 (1.93, 2.64)†	1.71 (1.45, 2.03)†	1.69 (1.48, 1.93)†	1.39 (1.22, 1.60)†
college only	3.56 (2.28, 5.58)†	3.07 (1.92, 4.91)†	3.90 (2.67, 5.69)†	3.69 (2.51, 5.41)†
no high school or college	1.00	1.00	1.00	1.00
Age (centered on 18 y)	0.95 (0.88, 1.03)	0.94 (0.87, 1.02)	0.98 (0.92, 1.05)	0.98 (0.91, 1.05)
Age 25 y or older (reference is 18 y)	0.63 (0.44, 0.90)*	0.59 (0.42, 0.84)‡	1.00 (0.74, 1.34)	0.96 (0.71, 1.30)
Year in school	1.01 (0.92, 1.11)	1.01 (0.92, 1.11)	1.02 (0.94, 1.10)	1.01 (0.93, 1.10)
Response rate (continuous)	1.01 (1.00, 1.01)§	1.01 (1.00, 1.01)§	1.01 (1.01, 1.02)†	1.01 (1.01, 1.02)†

§$P < .10$; *$P < .05$; ‡$P < .01$; †$P < .001$.

similar findings emerged (available upon request). Among male and female athletes and nonathletes, students were more likely to meet VPA criteria in college if they met VPA criteria in high school or if they participated in high school athletics. Adjusting for participation in high school athletics, we observed consistent findings among male athletes and nonathletes. Asian students and those over the age of 25 years had a lower likelihood of engaging in VPA in college. The findings between female athletes and nonathletes were also consistent. African American and Asian females were significantly less likely to engage in VPA in college, as were females of lower SEP.

Discussion

Entering college is an important transition that can influence vigorous physical activity levels. Most college students, more than 2 in 3, met recommended criteria for VPA in their final year in high school. However, fewer than half of all college students meet those criteria during college. Among traditional-age college students (under 25 years of age), VPA was relatively stable during college. Among nontraditional students, males had significantly lower levels of VPA, as did females who were athletes in high school. The large drop in activity for students in college compared to their own activity in high school and the lack of a continuing decline throughout the college years provides evidence that the transition to college influences physical activity.

Participation in sports appears to be a major determinant of vigorous activity, and declining activity rates may be related to the diminished opportunities to participate in organized athletics. Two in five students who were not involved in collegiate athletics engaged in VPA during college (45% for males, 40% for females) and were significantly less likely to do so compared to their peers involved in athletics. Half of college students (50%) participated in high school athletics. However, only 1 in 7 (15%) participated in collegiate athletics. VPA among former athletes dropped from more than 90% in high school to just over half of students in college (56%).

Expanding opportunities to participate in organized sports activities may be one way to increase VPA on a large scale. Many young children participate in some form of recreational athletics, and this is an important source of physical activity.[27] However, participation in sports declines as organized opportunities become more competitive, and the skills and fitness required to compete may reduce opportunities for being involved in athletics. A shift to greater emphasis on competition may be an important factor in declining rates of physical activity through the lifespan. As a nation, the United States has committed to promoting VPA.[26] However, these efforts have not focused on the role of recreational athletic participation in regular physical activity, and to date, no systematic commitment has been made to providing appropriate recreational opportunities that emphasize participation over competition and are matched to the participants' fitness and skill levels.

There were few differences in high school VPA among student subgroups in this sample of college students. These findings differ from other studies that find inequalities in VPA by race/ethnicity and SEP that begin to emerge during adolescence.[22, 25] It may be that social inequalities among college-bound high school students, itself an indicator of high SEP, do not emerge during high school. Despite

few reported differences in VPA during high school, we observed significantly less VPA in college among some student subgroups. Among female students we found significantly fewer African American and Asian students and students of low SEP engaging in recommended levels of VPA. These results provide evidence of increasing disparities in VPA in college.

This study has some important limitations, particularly with respect to the measurement of physical activity. Estimates of VPA can vary and depend on the type of measures used.[47] Physical activity measurement is a topic of considerable interest to researchers in epidemiology and exercise science and efforts have focused on improving precision using methods such as accelerometers, pedometers, GPS tracking, or heart rate monitoring.[48] Survey measures have only moderate correspondence with objective measures of physical activity,[49] and respondents tend to overestimate their activity levels on the self-report recall measures compared with simultaneous objective monitoring.[38] However, the expense of objective measures can make them impractical for large-scale surveillance.[50] Prevalence rates in the present study are consistent with other surveys on VPA.[16, 19, 51] The questions about physical activity were inserted into a nationally representative survey of college student alcohol use, and assessing physical activity was not the primary purpose of the study. As a result, we were limited to the 2 outcomes of vigorous physical activity. We did not collect survey data on other types of activity, such as moderate physical activity, that may permit evaluation of an individual's full range of activity that does not rise to the level of "vigorous." For example, college students often commute to class by walking or bicycling, and this activity would not be accounted for in our study. However, there are not good survey measures because of the nature of moderate-level physical activity and the difficulty in self-reporting this behavior accurately.[48] An additional limitation of the study is its cross-sectional design. Physical activity was assessed prior to entering college, although this measure may be subject to recall bias. However, some researchers have found evidence that recalled physical activity is moderately correlated with objective measures of health and fitness.[41] Nonresponse bias may have also influenced the results. We adjusted for response rate at the college level and stratified by high and low college response rate, and these analyses showed similar results. Finally, this study was limited to full-time college students attending 4-year colleges in the United States. The results of this study may have limited generalizibility to students who attend community colleges, colleges outside the United States, and emerging adults who do not attend college.

Despite important limitations, this study has several strengths that may advance understanding of physical activity. This study is the first to examine physical activity in a nationally representative sample of college students. The specific sampling employed allows inferences to be drawn about the national population of students attending 4-year colleges in the United States. College students are transitioning through a unique developmental period of emerging adulthood. Levels of vigorous activity are generally high during youth and adolescence and are low for adults.[18] Consequently, the transition linking these periods of relatively high to relatively low levels of activity may be important for understanding the decline in activity and how to prevent it. Finally, using survey measures comparable to those employed in other large-scale, nationally representative surveys provides an opportunity to directly compare rates of activity across other groups.

Lack of regular physical activity is associated with a wide variety of negative health outcomes, and physical activity is one potential mechanism through which social disparities in health may operate.[8] The transition from high school to college is associated with overall declines in VPA and increasing social disparities in VPA among female students. Colleges are potential settings that have broad reach that could be targeted for intervention efforts to promote activity and may be currently under utilized for promoting physical activity. Further research is needed to understand the mechanisms that may promote or impede VPA and contribute to social disparities during college. Additional research should investigate the trajectory of VPA among noncollege bound adolescents.

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