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Physical activity and sedentary behavior of U.S. immigrant versus non-immigrant adolescents: Findings from the NEXT Generation Health Study data

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Abstract

OBJECTIVE—This study examined associations of physical activity (PA) and sedentary behavior (SB) with adolescents' immigration status and language spoken at home and with friends.

METHODS—Participants (N=2,475) were included from Wave 1 of the NEXT Generation Health Study, a nationally representative 10th-grade cohort study starting in 2009. PA included recommended moderate-to-vigorous PA (MVPA) and vigorous PA (VPA); sedentary behavior included screen viewing and social media use. Linear and logistic regressions were conducted controlling for complex survey variables.

RESULTS—Adolescents with non U.S.-born compared with U.S.-born parents were less likely to engage in VPA (odds ratio=0.60, *p* .05, 95% CI=0.38–0.96). Parent country of origin and language spoken were not significantly associated with recommended MVPA engagement. None of screen viewing and social media use was significantly associated with immigration status.

CONCLUSIONS—Recent immigration status was negatively associated with adolescents' PA documenting an important health disparity.

Keywords

immigrant adolescents; language spoken; physical activity; sedentary behavior

INTRODUCTION

Excessive physical inactivity and sedentary behaviors are different among the immigrant population and their U.S. born counterparts.¹ Seen as an important health behavior, PA is shown to enhance general well-being;² in contrast, excessive SB contributes to adolescent overweight and obesity,³ which in turn results in deleterious health outcomes such as cardiovascular diseases and diabetes.^{4,5}

Significant differences have been found in gender and race/ethnicity concerning PA and SB among adolescents. Among young boys ages 9 through 12, PA marginally increases, but there is a steep decrease among boys ages 13 through 16. Adolescent girls experience a slight decline in PA, at younger ages (9–12 years) which is explained by the timing of puberty happening earlier than young males (13–16 years).⁶ Boys were more likely than girls to meet the recommendation for engaging in 60 minutes of PA at least 5 days or more per week, but also exceeded the SB recommendation for playing video games two or more hours per day; however, girls participated in computer use two or more hours per day compared to boys.⁷ A national representative profile study of SB reported that a significant portion of African-American children and adolescents watch more television, engage in more computer use, and have greater total hours of screen times compared to Mexican and European American adolescents.⁸

Although there is evidence that acculturation is related to obesity and PA among adults, there is limited research focused on adolescents. Adolescents who are recent immigrants may be at risk for poor health behaviors and outcomes when adjusting to life in the U.S. Research has shown that foreign-born adolescents' moderate-to-vigorous PA (MVPA) declines more rapidly from adolescence to adulthood compared to U.S. natives.⁹ First generation, non-English-speaking youth were less likely to engage in regular PA⁸ than third generation, English speaking youth. First and second generation Asian youth watched more hours of television and engaged less PA than White adolescents.¹⁰

Most studies on adolescents looking at the association of immigration status with PA and SBs have examined Hispanic/Latino populations.^{9,11} Although the Hispanic-Latino population is the fastest growing minority group in the U.S.,¹² it is important to examine possible similarities and differences concerning PA and SBs among overall immigrant population including all racial/ethnic groups.

The purpose of this study is to examine the associations of PA and SB with adolescents' immigration status and language spoken at home and with friends. We hypothesize adolescents born outside the U.S. and speak other languages at home or with friends would be less likely to meet the recommended PA requirements and would engage in more SBs.

METHODS

Participants (N=2,475) included in this study were from Wave 1 (2009–2010 school year) of the NEXT Generation Health Study, a nationally representative 10th-grade probability cohort. Sampling strategy was reported elsewhere.¹³ African American participants were oversampled to provide better population estimates and to provide an adequate sample to examine racial/ethnic differences. Parental consent and student assent was obtained for those participants under the age of 18 years old; participants 18 years of age or older provided consent. The study protocol was reviewed and approved by the Institutional Review Board of the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development.

Dependent variables

Physical Activity (PA)—Moderate-to-vigorous (MVPA) and vigorous (VPA) were based on questions regarding a 7-day period of time. For MVPA, participants were asked on how many of the past seven days (0–7 days) he or she is physically active for a total of 60 minutes per day. Responses were dichotomized as meeting (7 days) or not meeting recommendation (6 days or less) from the 2008 Physical Activity Guidelines for adolescents (17 years or younger).¹⁴ For VPA, questions asked how often and how many hours per week participants engage in VPA, either causing them to be out of breath or sweat. VPA scores were dichotomized to indicate those who engaged in VPA for at least 2 hours (using option “about 2 to 3 hours”) a week as meeting VPA recommendation versus those who did not. The MVPA and VPA criterion approximately reflects the 2008 Guidelines that adolescents should do 60 minutes a day for at least three days a week of VPA.¹⁴

Sedentary Behaviors (SB)—Screen viewing and social-media use were based on daily average hours per day, separately for weekdays and weekend. Screen viewing was assessed by how many hours per day participants watch television, DVDs, or videos during their free time. Social-media use measured the number of hours using a computer or cell phone for chatting online, browsing Internet, emailing, texting, tweeting, and any other similar behavior during participants’ free time. Average daily SB (in hours) was computed as [(weekday hours×5) + (weekend hours×2)]/7 days separately for screen viewing and social media. A dichotomous variables was created to indicate those who met or did not meet maximum 2 hours/day of sedentary behavior recommended by American Academy of Pediatrics.¹⁵

Independent Variables

Immigration Status—Immigration status was determined using the following questions: (1) In what country were you born? (2) Where was your mother born? (3) Where was your father born? Each question was dichotomized as born in or outside the U.S. Participants were categorized into three groups: adolescent and parents born outside the U.S. (first generation), (2) adolescent born in the U.S. and one or both parents born outside the U.S. (second generation), and (3) adolescent and parents born in the U.S. (third generation or higher).

Language Use—Language use was measured with two questions: “In your home, do you speak...?” and “With your friends, do you speak...?” Response options included only English, mostly English, English and another language equally, mostly another language, and only another language. Responses were dichotomized as only and mostly English, and other language spoken at least equally as English.

Covariates

Demographics—Participants answered demographic questions based on racial/ethnic background, gender, parental education, weight status, and urbanicity. Parental education was represented by the highest education for either mother or father (parent report): high school or less, some college/technical school, and Bachelor’s degree or higher. Weight status was grouped into three categorical intervals based on body mass index (BMI) measured:

normal weight, overweight, and obese according to CDC Growth Chart.¹⁶ Participant's urbanicity was categorized into three groups based on location of their school in an urban, suburban, or rural neighborhood community.¹⁷

Statistical Analysis

All statistical analyses were performed using SAS 9.4 (SAS Institute, Cary, NC). Features of the complex survey design (i.e., stratification, clustering, and sampling weights) were taken into account in the analyses.

Bivariate linear regressions were conducted to examine the association of SBs with each of immigration status variables and each potential covariate separately. Adjusted analyses were then conducted to include each of immigration status variables controlling for selected covariates ($p < .10$ in bivariate regressions).

Unadjusted binary logistic regressions were conducted to examine the association between MVPA and VPA, separately, with each immigration status variable and potential covariates. Multivariate logistic regressions were then conducted to control for selected covariates ($p < .10$ in bivariate models) in the final analyses.

Based on the findings in the previous models, interactions of immigration status by gender and, separately, parental education were tested in VPA model. In addition, interactions of language use spoken at home by demographic variables (i.e., ethnicity/race, gender, urbanicity, and parental education) were tested for social-media use.

Results

Demographics

Distributions of the sample for the demographic characteristics are found in Table 1. Majority of the participants and their parents were placed in the third generation or higher group (77%), followed by participants and their parents placed in the second generation group (17%), and participants and their parents who are foreign-born (first generation, 6%). Percentages of meeting physical activity recommendations and mean hours engaged in SB are showed in Table 2. For the prevalence of SBs, 46.11% (CI: 40.20–52.02) of participants who have watched TV more than 2 hours/day and 64.14% (CI: 64.14–72.89) of participants who have used computer more than 2 hours/day (not shown in the table).

Bivariate models

In the unadjusted models, immigration status was found to be associated with MVPA (OR=0.70, 95%CI 0.56–0.88) and VPA (OR=0.50, 95%CI 0.32–0.77) for adolescents with parent(s) born outside the U.S. compared to adolescents and their parents both U.S. born, which suggests that adolescents not born in the U.S. are less likely to meet the recommendations; language spoken with friends was also associated with MVPA (OR=0.67, 95%CI=.44–1.00; see Table 3). However, neither immigration status nor language spoken were associated with SB (see Table 4).

Adjusted models

We did not test adjusted models for SB as none of the bivariate associations between SB and immigration status variables is significant as showed in Table 4.

Adolescents born outside the U.S. were less likely to meet the VPA recommendations (AOR=0.60, 95%CI 0.38–0.96, $p=.03$) compared to adolescents and parents born outside the U.S. group. However, immigration status was not significantly associated with meeting MVPA recommendations (Table 5). Language use spoken at home or with friends were not significantly associated with meeting either MVPA or VPA recommendations (Table 5). Hypothesized interactions were tested but none is statistically significant ($p>.05$).

DISCUSSION

Using the large, nationally representative NEXT data, we tested the associations of participant's immigration status and language use spoken (at home and with friends) with meeting PA recommendations and amount of time spent engaging in SBs. No statistical significant findings for MVPA recommendations in the adjusted models, but for the VPA engagement recommendation, adolescents with parents born outside the U.S. were less likely to meet VPA recommendations compared to adolescents and parent all U.S. born. Significant relationships were not found for daily screen viewing, but social-media use (e.g., using a computer or cell phone) was significantly less for those participants that spoke other languages at home compared to those who spoke only/mostly English at home.

Limited VPA engagement among adolescents with parents born outside the U.S. and no association was found for MVPA may suggest there is something about how US adolescents engage in VPA that is limited for those of immigration status. This may reflect a host of social factors, such as, neighborhood environmental factors and school may influence immigrant adolescents' engagement in PA as well as other health behaviors.¹⁸ Similar to the general U.S. population, lack of PA may influence an increase in SB which can continue onto adulthood.⁹ Future studies are needed to examine patterns of PA and SB over time among recent immigrant adolescents and possible environmental, social, and other factors underlying disparities. Our findings are consistent with previous studies of adolescents from multiple ethnic groups¹ and those focused on Hispanic adolescents¹⁹ showing that recently emigrated youth are less likely to engage in adequate PA. Taverno et al.¹⁹ found Hispanic, non-English speaking youth reported less screen viewing than their English speaking counterparts, and Singh et al.¹ reported non-English speakers from a multi-ethnic sample reported less screen viewing. Notably, the results regarding language use are consistent despite screen viewing cut offs used in the studies. We extended the measurement of TV viewing in previous studies^{1,19} to include social-media use in our measure of SBs, but no significant associations of acculturative measures (i.e. immigration status and language use spoken) and SBs were found in this study, perhaps due to the ready accessibility to the internet and fewer barriers, such as language differences, in using social media.

In addition to our main hypotheses, there were several significant results concerning demographic variables in the adjusted models for screen viewing use and social media. African-American adolescents engaged the most in SBs, which are consistent with previous

studies that found that African Americans spent close to six hours watching television and two hours engaging in computer use²⁰ with African-American males spending the most time watching television compared to other racial/ethnic groups.¹¹ These findings suggest that reducing the amount of television viewing and social-media use may be useful target behaviors aiming at reducing sedentary time among African-American adolescents. As PA declines over time, SB may begin to increase in childhood and adolescence and continue onto adulthood⁹. Thus the transitional period from adolescence to adulthood may be an opportune time to modify malleable behaviors beneficial to the life course health. In addition, statistically significant gender differences were found such that males engaged in less social-media use and were more likely to meet the MVPA or VPA recommendations. The decrease in PA could be explained by females experiencing a decline in PA engagement due to home and work duties⁹ and experiencing earlier puberty.⁶ The non-significant interaction between independent variables and demographic variables indicate that the significant associations between language spoke at home and social-media use and between immigration status and VPA were not moderated by demographic variables.

There were several limitations in this study. Despite the large, nationally-representative sample size of the full cohort, the relatively small sample size of adolescents who had immigration background may reduce the power of testing the effect of immigration status and language spoken on health outcomes. Adolescents and their parents' immigration status were based on their responses to questions about being born in the U.S, but they were not asked to report how long they have lived in the U.S. Future studies should assess total number of months and years lived in the U.S. to better reflect the immigrant experience when examining the potential influence of immigration status on adolescent in health behaviors. In addition, the PA variables used in this study did not specifically address the different types of activities (e.g., sports, recreational exercise, and job-based activities). This was also similar to how SB items were single-item measures. More specific information about screen viewing and social-media use would be more informative to learn about immigrant adolescents' behaviors. Parental restrictions on the number of hours engaging in television viewing, game playing and computer/device use for social media, and accessibility of technology, such as number of televisions, computers, or other devices in given household could further explain SBs.

CONCLUSION AND IMPLICATIONS

Our findings indicate that immigration status is associated with the likelihood of meeting PA recommendations, but not with SB in the form of social-media use and daily screen viewing. A better understanding of the cultural or other mechanisms underlying these findings is needed and could help counselors, teachers, and researchers understand similarities and differences across racial/ethnic immigrant groups. It is plausible that some culturally bound values and beliefs about health and wellness may deter adolescents from engaging in PA. The ubiquitous nature of the internet and widespread ease of access to technologies may explain the lack of differences in our measures of SB, which were reflective of technology use. These results suggest that the association between recent immigration status and PA indicates an important health disparity in need of further research.

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Table 1

Demographic variables by weighted percentage (n=2,475)

	N	Weighted %	95% Confidence Interval	
Parent Immigration Status				
Third generation or higher	1440	77	3.23	8.68
Second generation	781	17	7.76	26.80
First generation	254	6	65.30	88.22
Language Use Spoken at Home				
Only or mostly English	1779	85	75.96	94.08
Other languages	719	15	5.92	24.04
Language Use Spoken with Friends				
Only or mostly English	2259	93	87.30	98.49
Other languages	243	7	1.51	12.70
Gender				
Male	1132	46	42.05	49.09
Female	1386	54	50.91	57.95
Ethnicity				
Hispanic	797	20	11.43	27.73
African-American	485	18	9.93	25.18
White	1098	58	46.60	69.24
Other	134	5	2.75	7.15
Urbanicity				
Urban	899	14	0.00	28.21
Suburban	862	51	29.94	71.62
Rural	763	35	19.45	51.24
Parent Education				
High school or less	936	33	27.38	39.58
Some college/technical school/advanced degree	865	40	36.25	43.25
Bachelor's degree or higher	560	27	20.60	32.94
Weight Status				
Normal Weight	1412	59	55.92	63.04
Overweight	448	19	16.40	20.63
Obese	487	21	17.81	23.32

Notes. First generation: adolescent and parents born outside the U.S. second generation: adolescent born in the U.S. and one or both parents born outside the U.S. Third generation or higher: adolescent and parents born in the U.S.

Table 2

Percentages (weighted) for meeting physical activity recommendations and means for sedentary behavior

		MVPA		VPA		Social-media Use ^a		Daily Screen View ^b				
		%	95% CI	%	95% CI	Mean (in hours)	95% CI	Mean (in hours)	95% CI			
Parent Immigration Status												
Third generation or higher	21	16.41	25.33	52	43.83	60.61	3.95	3.82	4.08	2.23	2.14	2.32
Second generation	3	1.09	5.14	11	5.50	15.57	3.93	3.75	4.11	2.28	2.15	2.41
First generation	1	0.56	2.35	3	1.80	4.22	3.42	3.12	3.72	2.28	2.06	2.49
Language Spoken at Home												
Only or mostly English	22	18.26	26.53	57	49.93	64.94	3.95	3.83	4.07	2.26	2.17	2.34
Other languages	3	1.06	5.07	9	4.11	12.91	3.73	3.54	3.92	2.25	2.12	2.38
Language Spoken with Friends												
Only or mostly English	24	20.42	27.80	62	55.29	67.76	3.89	3.89	4.00	2.24	2.17	2.31
Other languages	1	<0.001	2.82	4	1.35	7.28	3.79	3.47	4.12	2.41	2.18	2.64

Note:

^aSocial-media Use: using computers, the internet, or cell phone based average hours of weekday and weekend.

^bTV SB: TV/DVD/Video based average hours of weekday and weekend.

CI: Confidence Interval. MVPA: moderate-to-vigorous physical activity VPA: vigorous physical activity. First generation: adolescent and parents born outside the U.S. second generation: adolescent born in the U.S. and one or both parents born outside the U.S. Third generation or higher: adolescent and parents born in the U.S.

Table 3

Bivariate (unadjusted) logistic regression models for physical activity

	MVPA			VPA		
	OR	95% CI	p	OR	95% CI	p
Parent Immigration Status (ref=Third generation)						
Second generation	0.70	0.56 – 0.88	<.001	0.74	0.54 – 1.02	0.07
First generation	0.93	0.67 – 1.28	0.65	0.50	0.32 – 0.77	<.001
Language Spoken at Home (ref=only or mostly English)						
Other languages	0.75	0.56 – 1.01	0.06	0.64	0.43 – 0.94	0.02
Language Spoken with Friends (ref=only or mostly English)						
Other languages	0.67	0.44 – 1.00	0.05	0.78	0.49 – 1.23	0.29
Gender (ref= Female)						
Male	2.10	1.70 – 2.60	<.001	1.84	1.37 – 2.47	<.001
Ethnicity/Race (ref=White)						
Hispanic	0.66	0.51 – 0.84	<.001	0.58	0.39 – 0.86	0.01
African-American	0.69	0.51 – 0.93	0.01	0.60	0.41 – 0.89	0.01
Other	1.36	0.54 – 3.44	0.52	1.04	0.47 – 2.34	0.92
Urbanicity (ref=urban)						
Rural	1.44	1.09 – 1.90	0.01	1.73	1.01 – 2.96	0.05
Suburban	1.30	0.99 – 1.71	0.06	1.34	0.80 – 2.26	0.27
Parental education (ref=Bachelor's degree or higher)						
High school or less	0.56	0.36 – 0.87	0.01	0.38	0.27 – 0.54	<.001
Some college	0.76	0.50 – 1.15	0.19	0.43	0.32 – 0.58	<.001
Weight status (ref=Normal weight)						
Over weight	0.95	0.66 – 1.36	0.77	1.11	0.85 – 1.45	0.44
Obese	0.79	0.61 – 1.01	0.06	0.75	0.53 – 1.06	0.10

Notes.

OR: odds ratio; CI: Confidence Interval. MVPA: moderate-to-vigorous physical activity VPA: vigorous physical activity. First generation: adolescent and parents born outside the U.S. second generation: adolescent born in the U.S. and one or both parents born outside the U.S. Third generation or higher: adolescent and parents born in the U.S.

Table 4

Bivariate (unadjusted) logistic regression models for sedentary behaviors

	Social-media Use			Daily Screen Viewing		
	OR	95% CI	p	OR	95% CI	p
Parent Immigration Status (ref=Third generation)						
Second generation	0.91	0.67–1.25	0.54	0.95	0.66–1.37	0.78
First generation	0.95	0.66–1.37	0.78	0.91	0.67–1.25	0.54
Language Spoken at Home (ref=only or mostly English)						
Other languages	1.09	0.81–1.46	0.56	1.09	0.81–1.46	0.56
Language Spoken with Friends (ref=only or mostly English)						
Other languages	1.15	0.73–1.81	0.54	1.15	0.73–1.81	0.54
Gender (ref=Female)						
Male	0.69	0.54–0.88	<.01	0.69	0.54–0.88	<.01
Ethnicity/Race (ref=White)						
Hispanic	1.26	0.92–1.72	0.15	1.26	0.92–1.72	0.15
African-American	2.26	1.56–3.27	<.001	2.26	1.56–3.27	<.001
Other	1.17	0.82–1.67	0.36	1.17	0.82–1.67	0.36
Urbanicity (ref=urban)						
Rural	0.78	0.60–1.03	0.07	0.78	0.60–1.03	0.07
Suburban	1.08	0.66–1.79	0.75	1.08	0.66–1.79	0.75
Parental education (ref=Bachelor's degree or higher)						
High school or less	1.20	0.83–1.74	0.32	1.20	0.83–1.74	0.32
Some college	1.46	0.98–2.20	0.06	1.46	0.98–2.20	0.06
Weight status (ref=Normal weight)						
Over weight	1.32	0.97–1.80	0.08	1.32	0.97–1.80	0.08
Obese	1.13	0.74–1.72	0.57	1.13	0.74–1.72	0.57

First generation: adolescent and parents born outside the U.S. second generation: adolescent born in the U.S. and one or both parents born outside the U.S. Third generation or higher: adolescent and parents born in the U.S.

Table 5

Adjusted logistic regression model of physical activity

	MVPA			VPA				
	OR	95% CI	p	OR	95% CI	p		
Parent Immigration Status (ref=Third generation) [†]								
Second generation	0.71	0.41	1.22	.20	0.95	0.64	1.43	.82
First generation	0.85	0.35	2.06	.70	0.60	0.38	0.96	.03
Language Spoken at Home (ref= Only or mostly English) [†]								
Other languages	0.89	0.55	1.43	.62	0.87	0.54	1.40	.56
Language Spoken with Friends (ref = Only or mostly English) [†]								
Other languages	0.67	0.46	0.97	.74	1.14	0.70	1.88	.60

Notes.

[†] Immigration status variable and Language use variables were tested in separate model controlling for selected covariates: ethnicity/race, gender, urbanicity, parental education (not for MVPA), and weight status.

OR: odds ratio; CI: Confidence Interval. MVPA: moderate-to-vigorous physical activity VPA: vigorous physical activity. First generation: adolescent and parents born outside the U.S. second generation: adolescent born in the U.S. and one or both parents born outside the U.S. Third generation or higher: adolescent and parents born in the U.S.