

# Park Access Among School-Age Youth in the United States

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**Background:** Fewer than 30% of U.S. youth meet the recommendation to be active  $\geq 60$  minutes/day. Access to parks may encourage higher levels of physical activity. **Purpose:** To examine differences in park access among U.S. school-age youth, by demographic characteristics and urbanicity of block group. **Methods:** Park data from 2012 were obtained from TomTom, Incorporated. Population data were obtained from the 2010 U.S. Census and American Community Survey 2006–2010. Using a park access score for each block group based on the number of national, state or local parks within one-half mile, we examined park access among youth by majority race/ethnicity, median household income, median education, and urbanicity of block groups. **Results:** Overall, 61.3% of school-age youth had park access—64.3% in urban, 36.5% in large rural, 37.8% in small rural, and 35.8% in isolated block groups. Park access was higher among youth in block groups with higher median household income and higher median education. **Conclusion:** Urban youth are more likely to have park access. However, park access also varies by race/ethnicity, median education, and median household. Considering both the demographics and urbanicity may lead to better characterization of park access and its association with physical activity among youth.

**Keywords:** public health, built environment, physical activity, surveillance

Physically active youth gain many health benefits. Physical activity helps youth build strong bones and muscles, have favorable body composition, improve aerobic fitness, and reduce risk factors for cardiovascular diseases, such as elevated blood pressure and blood lipids.<sup>1</sup> Current Federal guidelines<sup>1</sup> recommend children and adolescents be physically active at least 60 minutes daily; however, fewer than 30% of students in grades 9–12 meet this guideline.<sup>1,2</sup> The Guide to Community Preventive Services recommends creating or improving access to places for physical activity as a way to increase physical activity in communities, including youth.<sup>3</sup> One way to encourage physical activity may be to provide youth access to parks. Furthermore, understanding the differences in park access among youth in urban, rural, and suburban neighborhoods can help inform public health programs designed to increase physical activity among youth.

Youth who have parks nearby tend to be more physically active than those who do not live near parks.<sup>4–7</sup> In an experimental study where youth decreased their sedentary behavior, increasing the time spent being physically active was associated with living near parks.<sup>5</sup> In another study, girls with parks located within a one-half mile radius of their homes were more physically active after school compared with girls who lived farther from parks.<sup>4</sup> Similarly, children aged 4–7 years spent more time being physically active if they lived in neighborhoods with more parks or recreation areas compared with those who lived in neighborhoods without such areas.<sup>7</sup> Additionally, compared with youth who lived in neighborhoods with parks

or playgrounds, those who lived in neighborhoods without parks or playgrounds were more likely to watch more hours of television, to be physically inactive, and to be obese or overweight.<sup>8</sup>

Several studies have found that youth in urban areas are less physically active than youth in rural areas.<sup>8–10</sup> Liu et al<sup>8</sup> found that urban children were more likely to be physically inactive than rural children. Moore et al<sup>10</sup> found that rural girls were more likely to meet the aerobic physical activity guideline for children compared with suburban and urban girls. Understanding the differences in neighborhood park environments where youth can meet physical activity guidelines can help focus public health and park and recreation resources used to improve physical activity, particularly in urban neighborhoods.

In addition, measuring park access by spatial characteristics may uncover differences by urban vs rural area and by demographic characteristics of the neighborhoods surrounding the parks. For example, spatial access to parks in rural block groups shows residents are, on average, located farther from parks compared with residents of urban block groups.<sup>11,12</sup> Studies also have examined park access in specific cities by demographic characteristics such as race/ethnicity and socioeconomic status, though these findings have been mixed, and very few studies have been national in scope.<sup>9,10,12–15</sup> Some studies have shown that neighborhoods that are poor, have high unemployment, and have fewer college-educated adults have less park access.<sup>13,15</sup> However, other studies show neighborhoods with lower socioeconomic indicators have better access to parks and play areas.<sup>9,14</sup> In addition, it is not clear whether urban or rural classifications affect disparities in park access, particularly among youth. Understanding the complexities of park access among rural, urban, and suburban neighborhoods can inform public health programming designed to increase physical activity among youth. Thus, the goal of this study was to examine spatial access to parks in the United States among school-age youth at the U.S. Census block group level, by demographic characteristics and urban-rural classification.

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## Methods

### Parks

The boundaries of local, state, and national parks and forests were defined by the 2012 land-use layer from TomTom, Inc. The park polygons were selected using feature type (FEATTYP) 7170, to include national and state forests and parks, as well as local parks and recreation areas.

### Demographic Characteristics

Estimates of population stratified by age, race, and ethnicity were based on data from the 2010 U.S. Census and, by income and education level, on the American Community Survey (ACS) 2006–2010. ACS 2006–2010, rather than the more recent ACS 2009–2013 data were used as the former are defined on block group boundaries identical to those in the 2010 Census.

The demographic variables included in this study were age, race/ethnicity, median education level, and median household income; all were collected at the block group level. School-age youth were defined as persons aged 5–17 years. For race/ethnicity, block groups with ethnic Hispanic majorities among school-age youth were classified as Hispanic; the other block groups were classified by racial majority among school-age youth as white, black, American Indian/Alaskan Native, Asian/Pacific Islander, or Multiracial. Block groups that did not have a majority school-age racial/ethnic group were classified as No Majority. Median education was defined by the median education level of residents aged 25 years or older in the block group, and was classified as less than high school, high school graduate, some college, or college graduate. Median annual household income for each block group was classified using cut-points of \$35,000, \$50,000, and \$75,000.

Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban Commuting Area (RUCA) codes (<http://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes.aspx>). RUCA codes classify U.S. Census tracts based on urbanization, population density, and commuting patterns in a manner that incorporates degree of influence from nearby urbanized areas. Block groups were assigned the RUCA code of the census tract in which they fell.

### Park Access

People will walk about half a mile to reach a destination.<sup>15,16</sup> A straight distance of one-half mile or less has been used as a measure of spatial access in studies on healthy neighborhood environments, walkability, and park access.<sup>17–19</sup> Paralleling the approach used by Nicholls<sup>20</sup> to measure access and distributional equity within a park system, we defined the *park access score* for a block group as the average number of parks within one-half mile of the blocks in the block group. Thus,

$$\text{Park access score} = \text{Block proximity sum} \div \text{Block count}$$

where

*Block proximity sum* is the number of parks completely or partially within a half mile straight distance of each block (including parks that fall within the block boundary), summed over all blocks in a block group. A park that was within one-half mile straight distance of more than 1 block in a block group

was counted as a unique park for each block, and *Block count* is the number of blocks in the block group.

The park access score was classified into 4 categories (no park access: park access score = 0; low park access: park access score = 0.001–0.499; moderate park access: park access score = 0.500–1.499; and high park access: park access score =  $\geq 1.500$ ), based on the frequency distribution of all park access scores over all block groups. The median park access scores for block groups with no, low, moderate, and high park access were 0.00, 0.19, 1.00, and 2.41, respectively.

The study area was the 50 states of the United States and the District of Columbia. ArcGIS version 10.0 (Esri, Redlands, CA) and R version 3.0.1 (<http://www.r-project.org/>) were used to perform spatial analysis. All spatial layers were projected to North American Equidistant Conic coordinates.

## Results

We analyzed a total of 216,013 block groups from the 2010 U.S. Census data. The population of youth in each block group ranged from 0 to 6278 (median: 207 youth per block group). The median area for block groups in the United States was about one-half square miles, and there were 11,018,770 blocks included in all the block groups examined. The number of blocks in a block group averaged 51. The median park size was 0.05 km<sup>2</sup> (13 acres). In addition, 67.5% of block groups were classified as majority white, 10.6% were majority black, 12.8% were majority Hispanic, 0.9% were majority Asian/Pacific Islander, 0.3% were majority American Indian/Alaskan Native, and 7.8% did not have a majority race/ethnic group within the block group. A total of 42,868 parks were included in the analysis.

Overall, 61.3% of the 53,968,234 school-age youth lived in block groups within one-half mile of 1 or more parks (Table 1). In general, youth with park access were evenly distributed across block groups classified as having low, moderate, or high access to parks. However, park access varied by race/ethnicity, median education, and median household income. Of all block groups, those classified as majority Asian/Pacific Islanders had the greatest proportion of youth in high park access block groups, while youth who lived in majority American Indian/Alaskan Native block groups had the lowest proportion in high park access block groups. Block groups where the median education was less than high school had the greatest proportion of youth in high park access block groups, while block groups where the median education was some college had the lowest proportion in high park access block groups. By median household income, 17.2% to 23.7% of youth—those in the < \$35,000, \$35,000–\$49,999, and \$50,000–\$74,999 categories—lived in block groups with high park access. In block groups classified in the  $\geq$  \$75,000 median household income category, 21.6% of youth had high access to parks (Table 1).

Notable differences in park access among urban and rural classification of block groups were also found in this study. Park access was higher among youth living in urban block groups compared with those living in large rural, small rural, or isolated block groups for all racial/ethnic, education, and household income categories (Table 1). More than 64% of urban youth lived in block groups with park access, compared with only 36.5% in large rural, 37.8% in small rural, and 35.8% in isolated block groups. Across large rural, small rural, and isolated block groups, young people who lived in majority black block groups were more likely to have no park access

**Table 1 Proportion of U.S. School-Age Youth With Park Access<sup>a</sup> by Selected Demographic Characteristics and Park Access Category<sup>b</sup>**

Block group characteristics	N <sup>c</sup>	Park access <sup>b</sup> (%)				
		None	Any	Low	Moderate	High
Total	53,968,234	38.7	61.3	18.8	22.7	19.8
Majority race/ethnicity <sup>d</sup>						
White	35,195,654	44.3	55.7	21.7	20.3	13.8
Black	5,171,848	32.0	68.0	13.5	27.0	27.5
Asian/Pacific Islander	479,581	11.6	88.4	8.4	27.1	52.9
American Indian/Alaskan Native	178,010	67.3	32.7	28.3	3.7	0.6
Hispanic	8,801,675	26.1	73.9	12.6	29.0	32.2
No majority	4,084,783	28.7	71.3	14.7	25.1	31.6
Multiracial	56,683	22.1	77.9	19.6	24.8	33.5
Median household income <sup>e</sup>						
< \$35,000	10,724,158	39.5	60.5	13.2	23.6	23.7
\$35,000–\$49,999	13,337,511	43.4	56.6	17.2	21.5	17.9
\$50,000–\$74,999	16,208,045	41.4	58.6	20.4	21.1	17.2
≥ \$75,000	13,698,520	30.5	69.5	22.8	25.1	21.6
Median education <sup>c,f</sup>						
< High school	2,034,880	28.4	71.6	10.2	30.0	31.4
High school	20,784,731	44.5	55.5	16.4	20.9	18.2
Some college	23,704,632	38.7	61.3	21.2	22.4	17.7
College graduate	7,443,991	25.4	74.6	20.3	26.6	27.6
Urban-rural classification <sup>g</sup>						
Urban	48,057,294	35.7	64.3	18.4	24.0	21.9
Large rural	3,134,602	63.5	36.5	20.4	13.2	2.8
Small rural	1,536,742	62.2	37.8	22.4	13.6	1.8
Isolated	1,239,596	64.2	35.8	26.3	9.3	0.2

<sup>a</sup> Park access is defined as living in a block group intersecting an ≤ one-half mile straight distance buffer of a park boundary.

<sup>b</sup> Park access score = block proximity sum ÷ block count. The block proximity sum for a block group is the number of parks ≤ one-half mile straight distance from each block in the block group. The block count is the number of blocks within each block group. The block proximity sum was divided by the block count to get the park access score for each block group. Park access categories are none: park access score = 0, low: park access score = 0.001–0.499, moderate: park access score = 0.500–1.499, and high: park access score = ≥ 1.500.

<sup>c</sup> Some category totals do not equal N due to rounding. For the education category, 2084 school-age youth lived in 1100 block groups with no adults aged 25 years or older and, therefore, median education was undefined in these block groups.

<sup>d</sup> Block groups with ethnic Hispanic school-age majority were classified as Hispanic; other block groups were classified by school-age racial majority as white, black, American Indian/Alaskan Native, Asian/Pacific Islander, or Multiracial. Block groups that did not have a majority were classified as No Majority.

<sup>e</sup> Median household income was estimated for each block group by the U.S. Census Bureau.

<sup>f</sup> Median education was defined by the median education level of residents aged 25 years or older in the block group and was classified as less than high school, high school graduate, some college, or college graduate.

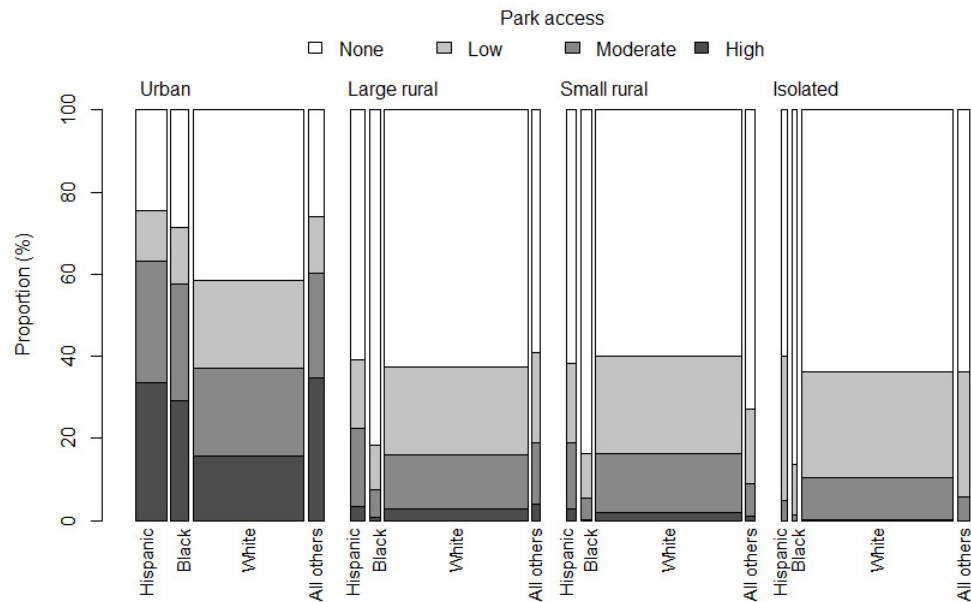
<sup>g</sup> Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban Commuting Area.

(Figure 1). Young people who lived in large rural, small rural, or isolated block groups where adults had less education (Figure 2) and lower household incomes (Figure 3) were more likely to have no access to parks.

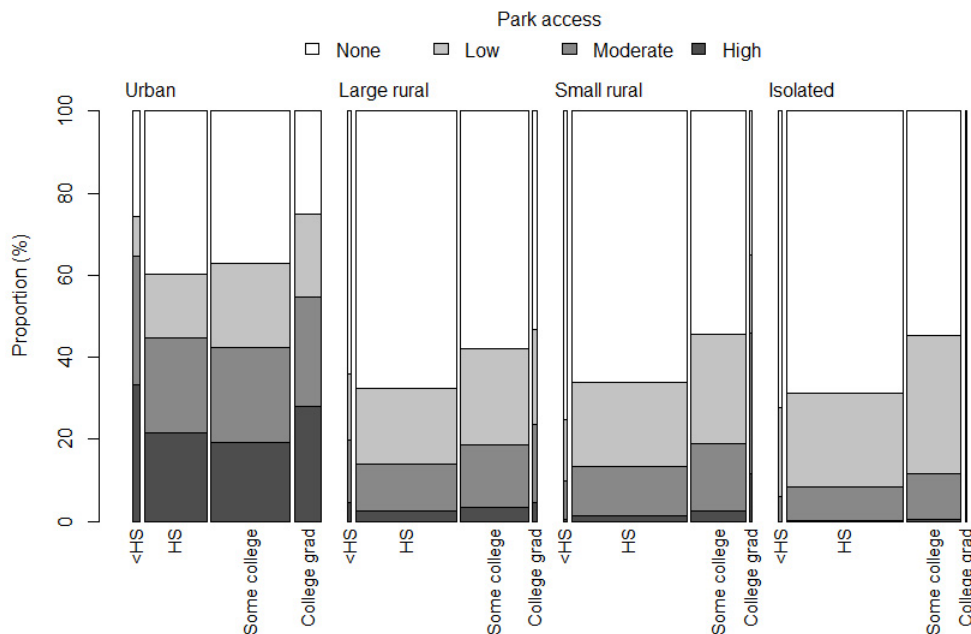
Odds of youth living in a block group within half mile of a park derived from adjusted multivariate models (Table 2) confirm both the demographic and urban-rural differences noted in univariate analysis. Majority race/ethnicity displays the largest range in odds in the adjusted models. The addition of urbanicity to the demographic variables brings odds ratios closer to unity. Considering

the 33,059,614 youth (61.3% of all youth) who live in the 134,767 block groups (62.4% of all block groups) within half mile of a park, 8.0% of the variance in park access score (raised to the one-third power for normality) is accounted for by block group demographic characteristics, and an additional 2.6% when urbanicity is added to the model.

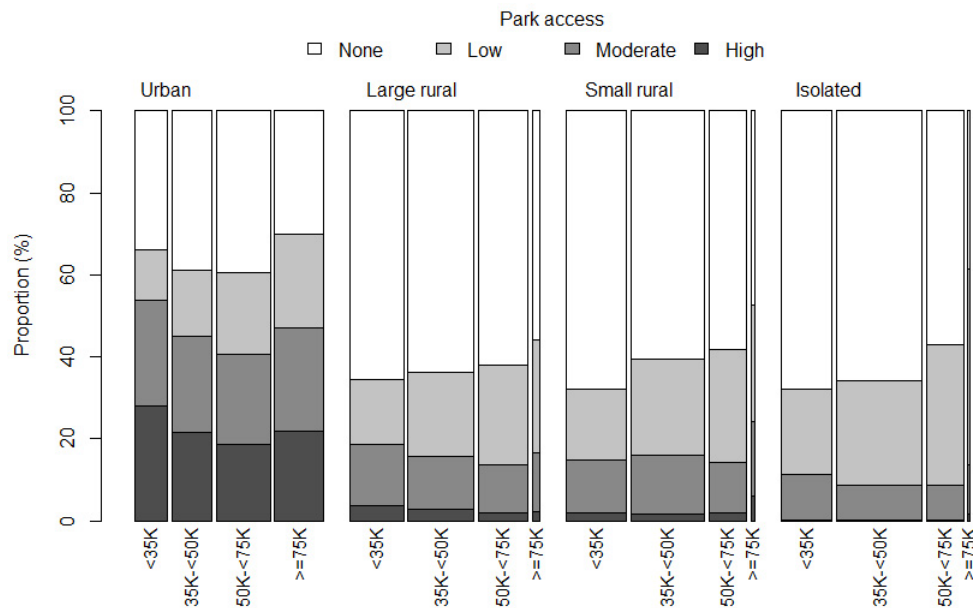
By state and territory, the proportion of youth who lived in block groups with park access ranged from 18.1% (Maine) to 100.0% (District of Columbia). States or territories where the largest proportions of youth had park access—District of Columbia



**Figure 1** — Park access among U.S. school-age youth by urban-rural status and race/ethnicity. *Note.* Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban Commuting Area (RUCA) codes. Block groups were assigned the RUCA code of the census tract in which they fell. Within each RUCA category, width of bar is proportional to the number of school-age children in respective racial/ethnic class. For race/ethnicity, block groups with ethnic Hispanic school-age majority were classified as Hispanic; other block groups were classified by school-age racial majority as white, black, American Indian/Alaskan Native, Asian/Pacific Islander, or Multiracial. Block groups that did not have a majority were classified as no majority. The category "All others" includes American Indian/Alaskan Native, Asian/Pacific Islander, Multiracial, and No Majority.



**Figure 2** — Park access among U.S. school-age youth by urban-rural status and median education. *Note.* Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban commuting area (RUCA) codes. Block groups were assigned the RUCA code of the census tract in which they fell. Within each RUCA category, width of bar is proportional to the number of school-age children in respective median education class. Median education was defined by the median education level of residents aged 25 years or older in the block group and was classified as less than high school, high school graduate, some college, or college graduate.



**Figure 3** — Park access among U.S. school-age youth by urban-rural status and median household income. *Note.* Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban commuting area (RUCA) codes. Block groups were assigned the RUCA code of the census tract in which they fell. Within each RUCA category, width of bar is proportional to the number of school-age children in respective median household income class. Median household income was estimated for each block group by the U.S. Census Bureau.

**Table 2 Odds-Ratio of Any Park Access Among U.S. School Age Youth, by Selected Demographic Characteristics and Urbanicity of Block Group**

Block group characteristics <sup>a</sup>	Model		
	Unadjusted <sup>b</sup>	Demographic only <sup>c</sup>	Fully adjusted <sup>d</sup>
Majority race/ethnicity			
White	1.00 (ref)	1.00 (ref)	1.00 (ref)
Black	1.69	2.38	2.08
Hispanic	2.25	3.25	2.84
All others	2.01	2.28	2.10
Median household income			
< \$35,000	0.67	0.65	0.77
\$35,000–\$49,999	0.57	0.66	0.76
\$50,000–\$74,999	0.62	0.72	0.77
≥ \$75,000	1.00 (ref)	1.00 (ref)	1.00 (ref)
Median education			
< High school	0.86	0.45	0.46
High school	0.42	0.40	0.42
Some college	0.54	0.57	0.59
College graduate	1.00 (ref)	1.00 (ref)	1.00 (ref)
Urban-rural classification			
Urban	1.00 (ref)		1.00 (ref)
Large rural	0.32		0.44
Small rural	0.34		0.49
Isolated	0.31		0.47

*Note.* All coefficients are different from zero ( $t$ -value > 80;  $P$ -value <  $10^{-200}$  for each coefficient).

<sup>a</sup> See Table 1 footnotes for definitions of block group characteristics.

<sup>b</sup> Odds ratios based on 4 separate models, each based on 1 block group characteristic.

<sup>c</sup> Odds ratios based on 1 model that includes all demographic block group characteristics.

<sup>d</sup> Odds ratios based on 1 model that includes all block group characteristic.



(100.0%), Illinois (85.9%), California (85.6%), and Connecticut (82.5%)—also had high proportions of their block groups classified as urban: 100.0%, 88.4%, 96.3%, and 99.3%, respectively (Figure 4). Conversely, states with the lowest proportions of youth with park access—Maine (18.1%) and North Dakota (21.8%)—also had low proportions of their block groups classified as urban: 57.2% and 43.1%, respectively. Block groups with high park access tended to cluster in the Northeast and Pacific West regions of the United States (Figure 5).

## Discussion

We found that more than 6 in 10 school-age youth in the United States have access to a park. Park access, however, depends largely on whether they live in an urban or a rural area. Fewer than 37% of youth living in rural or isolated areas have park access, compared with more than 64% of those living in urban areas. In addition, the differences in park access between urban and rural areas persist

when adjusted for race/ethnicity, median education levels, and median income levels. Those states with a greater proportion of urban block groups have a larger proportion of youth with access to parks.

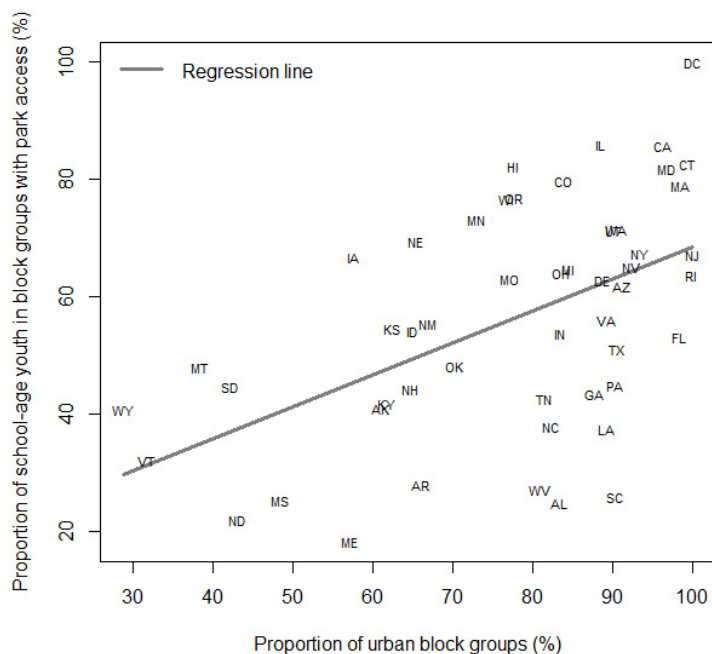
Our findings are similar to those from other studies on park access. One study used a different measure (the population-weighted distance to parks) to measure park access and, like our study, found that residents in rural states in the West and Midwest had to travel farther to local parks than did residents in urban states.<sup>12</sup> Specifically, residents of Alaska, Wyoming, and Montana had less access to local neighborhood parks than did those who lived in the District of Columbia and Connecticut. The same study also found that park access varied by demographic characteristics of block groups, and those block groups with majority Asians and Hispanics perhaps lived closer to neighborhood parks than did other racial majority groups. Our findings also are consistent with some studies of local neighborhoods showing that a greater proportion of poor people, blacks, and Hispanics also had greater access to parks.<sup>16,21</sup>

Our findings, however, are inconsistent with some national studies on the demographic characteristics associated with park access. One nationally representative study of more than 20,000 youth found that nonwhite and lower-income neighborhoods were half as likely as white, higher-income neighborhoods to have at least 1 physical activity facility, including parks, in their communities.<sup>22</sup> Yet another study found that communities with higher median household incomes and lower poverty rates were associated with increased availability of physical activity-related settings (ie, sports areas, parks and green space, public pools and beaches, and bike paths or lanes). Communities with a higher proportion of African Americans and the race category, Other, were associated with fewer physical activity-related settings.<sup>23</sup>

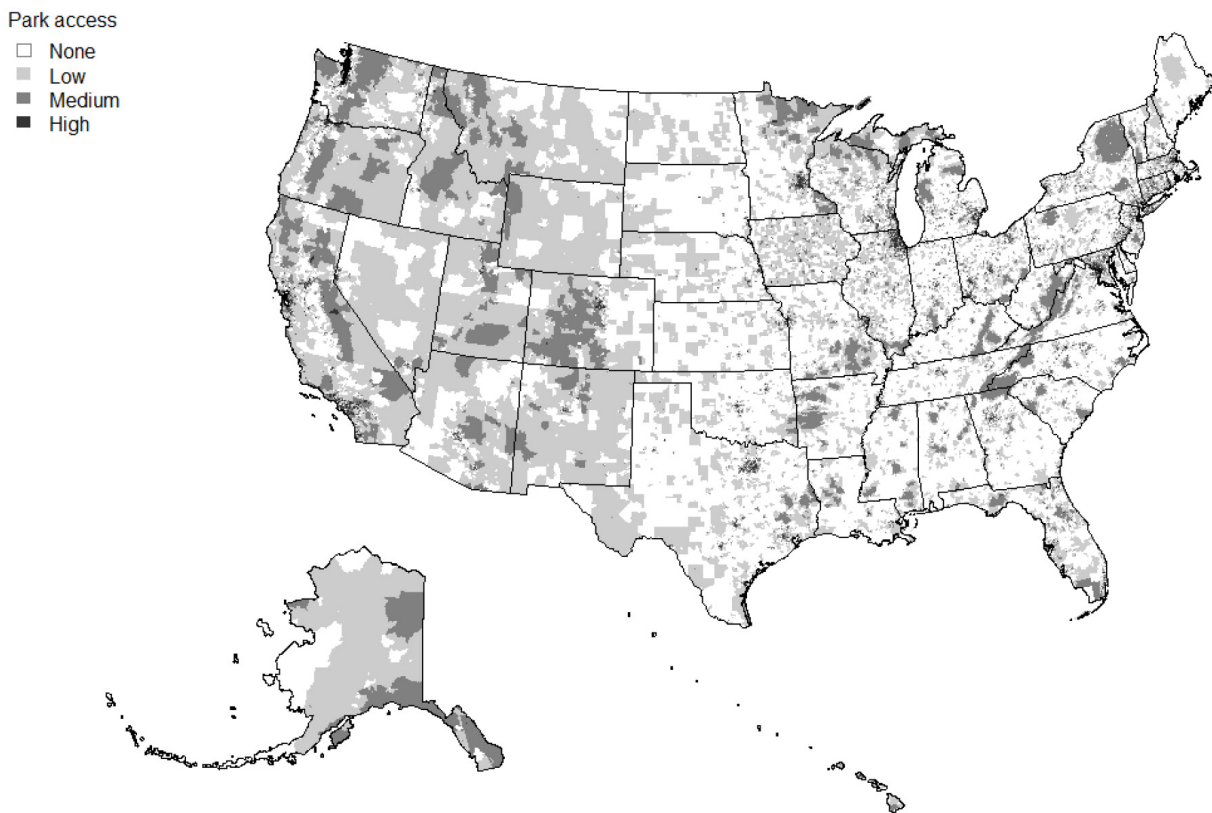
The varying results of park access are most likely due to the different methodologies used to assess population characteristics and park access. For example, Powell and colleagues included both park and recreational facility data as a measure of access, used telephone survey data to collect park measures, and did not examine the differences in access between urban and rural areas.<sup>23</sup> Using differing methodologies and data layers could lead to variations in study findings.

It is possible that different findings related to park access among youth that live in isolated or rural areas vs urban areas could be either differences in population density or the definition used to describe access. Most facilities and resources in rural areas tend to have greater geographic distances between them and, thus, using straight distance as a measure of access in rural areas may under- or overestimate access.<sup>24</sup> Park access may not be as high in isolated or rural areas as it is in urban areas, although some studies show those who live in rural areas have access to more green space—areas of vegetated land often used for recreational or aesthetic purposes—than those who live in urban areas.<sup>12</sup> Encouraging the use of available green space, therefore, may be a beneficial strategy for increasing access to places for physical activities in rural or isolated communities.

There are at least 3 limitations of this study. First, there is no standard mapping data set for parks in the United States. Second, we define park access based on straight-line distances from census blocks to parks, rather than using, for example, a spatial network analysis method. There is correspondence, however, between the current method and network analysis, as the 2 methods are highly correlated ( $r = 0.58$ – $0.95$ ) in urban areas.<sup>25</sup> However, the data for measuring park access nationally using the network analysis method do not currently exist. Finally, our study does not assess park quality



**Figure 4** — Park access among U.S. school-age youth by proportion of urban block groups. *Abbreviations:* Alabama (AL), Alaska (AK), Arizona (AZ), Arkansas (AR), California (CA), Colorado (CO), Connecticut (CT), Delaware (DE), District of Columbia (DC), Florida (FL), Georgia (GA), Hawaii (HI), Idaho (ID), Illinois (IL), Indiana (IN), Iowa (IA), Kansas (KS), Kentucky (KY), Louisiana (LA), Maine (ME), Maryland (MD), Massachusetts (MA), Michigan (MI), Minnesota (MN), Mississippi (MS), Missouri (MO), Montana (MT), Nebraska (NE), Nevada (NV), New Hampshire (NH), New Jersey (NJ), New Mexico (NM), New York (NY), North Carolina (NC), North Dakota (ND), Ohio (OH), Oklahoma (OK), Oregon (OR), Pennsylvania (PA), Rhode Island (RI), South Carolina (SC), South Dakota (SD), Tennessee (TN), Texas (TX), Utah (UT), Vermont (VT), Virginia (VA), Washington (WA), West Virginia (WV), Wisconsin (WI), Wyoming (WY). *Note.* Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban commuting area (RUCA) codes. Block groups were assigned the RUCA code of the census tract in which they fell. Linear least squares fit regression line presented.



**Figure 5** — Park access among U.S. school-age youth by block group and park access score. *Note.* Park access is defined as living in a block group intersecting a  $\leq$  one-half mile straight distance buffer of a park boundary. Park access score = block proximity sum  $\div$  block count. The block proximity sum for a block group is the number of parks  $\leq$  one-half mile straight distance of each block. Block count is the number of blocks within each block group. The block proximity sum was divided by the block count to get the park access score for each block group. None: park access score = 0; low: park access score = 0.001–0.499; moderate: park access score = 0.500–1.499; and high: park access score  $\geq$  1.500. \* Block groups were classified as urban, large rural, small rural, or isolated as defined by the USDA's Economic Research Service Rural-Urban commuting area (RUCA) codes. Block groups were assigned the RUCA code of the census tract in which they fell.

or frequency of park use; however, data to construct such measures do not exist on a national scale.

Because of differences in access to parks in the United States—fewer than 37% of rural youth vs more than 64% of urban youth living in block groups with park access—different strategies to increase access to parks could be explored by state health departments, community planners, and public health professionals. Creating parks in areas that lack access may not be feasible, but sharing existing facilities in schools and communities may be a useful strategy for providing places to be physically active.<sup>26,27</sup> Additionally, in areas where there are no parks and where schools are farther from homes, places such as green or open spaces could be used for physical activities where youth can engage in structured or free play.<sup>28</sup> For those in urban areas with access to parks, using available park programming, amenities, and safety improvements could increase the use of parks for physical activity.<sup>4</sup>

In conclusion, this study found that more than half of U.S. school-age youth live in a block group within half a mile of a park. However, fewer than 37% of youth young people living in rural or isolated areas have park access, compared with more than 64% of those living in urban areas. These findings also suggest that differences in park access between urban and rural areas persist regardless of race/ethnicity, median education levels, and median income levels. Urban-rural classification is the main disparity in

park access among block groups, and confounds demographic disparities. Considering both the demographic characteristics and urban-rural classification of block groups may lead to better estimates of disparities in park access.

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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