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Assessing environmental support for better health: Active living opportunity audits in rural communities in the southern United States

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Introduction

Despite decades of research focused on eliminating health disparities, differences in incidence and mortality from chronic diseases such as cardiovascular disease, cancer, diabetes, and obesity persist and are noted by race, socioeconomic status, and geographic location (Braveman et al., 2010; Orsi et al., 2010; U.S. Department of Health and Human Services, 2014; Singh et al., 2011). Previous research provides evidence that social, neighborhood, and environmental characteristics play an important role in influencing health in communities (Casagrande et al., 2009, Diez Roux and Mair, 2010, Doubeni et al., 2011, Siceloff et al., 2013), perhaps by limiting access to health promoting resources.

Differences in physical activity and other modifiable health behaviors may provide insights to health disparities. Health behavior is linked to socioeconomic and environmental aspects

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of where people live (Calise et al., 2013; Xu et al., 2013). Leisure-time physical activity in the United States (U.S.) is lower in rural settings (Martin et al., 2005; Michimi and Wimberly, 2010; Moore et al., 2013; Reis, et al., 2004), among minorities, women, and lower socioeconomic status individuals and communities (Cerin and Leslie, 2008; U.S. Department of Health and Human Services, 2014). Physical inactivity, defined as insufficient amounts based on the current recommendations (Haskell et al., 2007), is an independent risk factor for all-cause mortality and other chronic diseases worldwide (Artinian et al., 2010; Go et al., 2014; Lee et al., 2012; Patel et al., 2013), with risk similar to that of smoking and obesity (Lee et al., 2003; Lee et al., 2012). While evidence indicates the burden of many chronic diseases in U.S. rural and Southern communities is greater than in other regions or in urban areas (Befort et al., 2012; Jackson et al., 2013; U.S. Department of Health and Human Services, 2014), data on rural policy and built environment associations with modifiable health behaviors are limited. Few studies have investigated the effect of the rural built environment on physical activity or assessed multiple factors together using a socio-ecological approach. In a recent review, aesthetics, trails, safety from crime, parks, and walkable destinations were generally positively associated with physical activity in rural-dwelling adults, while sidewalks or shoulders were associated in some studies but not in others. However, only a few studies were included (Frost et al., 2010).

The purpose of this study was to describe the built environmental, policies, and availability of facilities for physical activity in eight rural communities to inform a diet and physical activity intervention as part of an ongoing academic-community partnership to eliminate cancer health disparities in the Deep South. The *Deep South Network for Cancer Control* (DSN) was established in response to a request for applications for the development of Special Population Networks to reduce disparities among racial minorities. African Americans are the largest minority population in the Deep South (Partridge et al., 2005). The DSN is a collaboration between the University of Alabama (AL) at Birmingham, the University of Mississippi (MS) Medical Center, and community partners in 20 counties using a community-based participatory research (CBPR) approach in AL and MS (Hardy et al., 2012). Using the Rural Active Living Assessment (RALA) tools (Yousefian et al., 2010), we assessed neighborhood characteristics, town programs and policies, and town-wide facilities for physical activity in the eight counties within the AL Black Belt (Bullock, Perry, Sumter, and Wilcox counties) and the MS Delta (Grenada, Humphreys, Panola, and Yazoo counties) of the DSN that are participating in the full research project. These counties are similar, with historical lack of access to adequate health and social services, and a predominately agricultural economy (Lisovicz et al., 2006). In 2000, the average per capita income for the Black Belt was $12,691 and $12,074 in the Delta (U.S. Census Bureau, 2000). These counties are also similar with respect to rates of poverty (22–41%) and black population (42–75%). More recently, the average per capita income of our study counties in AL was $15,441, and $16,186 in MS, with 31% overall in poverty (U.S. Census Bureau, 2011) (Table 1).

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Methods

Instrument

Communities were audited using the RALA tools designed for conducting rural physical activity audits (Yousefian et al., 2010). The RALA includes three instruments. The Street Segment Assessment (SSA) assesses characteristics of individual street segments to evaluate terrain, walkability, safety features, road/traffic conditions, connectivity, and use. Two questions asked for a subjective assessment of the segment as walkable and aesthetically pleasing. The Town-wide Assessment (TWA) assesses characteristics of the community as a whole including population, total area, and presence of recreational amenities. Finally, the Town Program and Policy Assessment (PPA) captures information on community programs and policies that support physical activity (e.g., policies on bike lanes and transportation and programs offered by the public recreational department). A scoring algorithm for TWA and PPA was used to provide measures that could be used to compare rural towns (Hartley, 2010).

Procedures

Since the DSN focuses on reducing cancer in minorities and our planned intervention includes only African American women, street segments were determined by identifying communities within each county with the highest concentrations of African Americans to provide information for the intervention. Four types of segments (Town Center, Isolated School Zone, Neighborhood, & Thoroughfare) were selected. Project staff generated a list of street segments in each county based on methods suggested by Yousefian and colleagues (2010). Local staff then conducted “ground-truthing” (Paquet et al., 2008) to verify segment locations, visibility of street boundaries (e.g., street sign, mile marker), and assess potential safety hazards for auditors. Modifications to the initial list were made as needed.

The SSA tool was completed by local Community Health Advisors trained as Research Partners (CHARPs) (Hardy et al., 2005). Two to four CHARPs in each county were selected because of their familiarity with their community and established relationship with DSN. All CHARPs were residents of the county being surveyed and were of similar demographic backgrounds. CHARPs who were physically unable to walk or who had transportation challenges were excluded from participation in this activity.

CHARPs attended a 2–3 hour training session for his/her specific community on the use of the tool. Training included didactic instruction and field testing. As part of the training, each CHARP was given 3 practice street segments similar to the ones they would be assessing. The trainer determined proficiency by reviewing each CHARP's responses on the practice segments and comparing the trainee assessments with assessments completed by the trainer. Trainees were considered proficient if the scores agreed with the trainer’s assessment on the same three practice segments. CHARPS who had difficulty in achieving proficiency initially and after further training did not collect street segment data. After demonstrating competency, each CHARP assessed 4–6 street segments within their community over a 2-week period using the SSA and a map showing the street segments assigned. County coordinators reviewed each form after data were collected and delivered for consistency and

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completeness, thus providing regular quality assurance checks. The TWA and PPA tools were completed by trained local project staff with extensive familiarity with the targeted communities. Data were obtained from local town offices, U.S. Census, the local chamber of commerce, and government and public safety offices online sources.

Data Scoring and Analysis—Domain and total scores were calculated for the PPA and TWA tools using the scoring algorithm developed by instrument developers (Hartley, 2010). Possible total scores for both the PPA and TWA were 0–100.

For the PPA, the score possible on the town policy domain was 0–10, while town programs, school policies, and school programs domain scores could range from 0–30. TWA domain maximum scores were 10 for the water activities, 15 for school location, 20 for trails, 25 for parks and playgrounds, and 30 for recreation facilities. For each scoring system, greater points are assigned for items that increase opportunities for physical activity. Characteristics of the rural environment supportive of walking from the segments were collapsed by county to provide an overall assessment of the activity opportunities available to the county residents and study participants. Data were summarized using frequencies, percentages, and measures of central tendency, as appropriate, for the SSA, PPA, and TWA tools using SAS 9.3 (SAS Institute, 2012). State comparisons were conducted using Kruskal-Wallis tests. There is no scoring system for the SSA, so only descriptive data were possible.

Results

RALA Segment Assessment

RALA segment assessments were completed by 27 CHARPs on 117 segments in 22 towns. Sixty of the segment assessments were conducted in the four AL counties and 57 were completed in the four MS counties.

Sidewalks were available on one or both sides of the road in 10–40% of the assessed segments with 30% in AL (range 20–40%) versus 23% in MS (range 10–31%)(Table 2). Shoulders where people could potentially walk varied widely (AL 47%, MS 31.5%) and were present in 13–70% of the communities. Overall, 86% of segments within the communities had a safety feature such as traffic lights, stop signs, school flashing lights, speed bumps, and/or public lighting (range 69–100%). The town segments assessed in AL had greater connectivity to other segments, roads, or to town (67%, range 40–93%) compared to MS communities (17.5%, range 6–40%) and a higher percentage of public and commercial destinations compared to MS (p=0.04). The majority of segments had either public (overall 55%, range 38–75%) or commercial (overall 44%, range 27–60%) destinations to which residents might walk. Overall, 74% of the segments were rated as walkable (57–87%) while 88% were rated aesthetically pleasing (73–100%) by CHARPs.

Town Program and Policy Assessment

Only one of the eight communities, located in Humphreys, MS, had a town policy requiring bikeways or pedestrian walkways in new public infrastructure projects (town policies domain) (Table 3). Town Programs domain scores ranged from 0 in Wilcox County, AL to 30, the maximum score possible, in Humphreys County, MS, with means in AL of 17 and

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23 in MS. School policies domain scores, indicating public access to school recreational facilities after school and/or a late transportation option for children who participated in after school activities, ranged from 15–30 (of 30) and mean scores of 19 in AL and 23 in MS. Most communities had some type of school program, with domain scores from 0–30 (30 possible; AL $\bar{x}$ = 14, MS $\bar{x}$ = 13), with the exception of those in Wilcox, AL and Panola, MS. Total scores for the town PPA ranged from a low of 15 in Wilcox County, AL to highs of 85 and 86 in Humphreys, MS and Bullock, AL, respectively (100 possible). Overall, mean scores tended to be higher for MS ($\bar{x}$ = 61, S.D.=19) compared to AL ($\bar{x}$ = 49, S.D.=29).

Town Wide Assessment

All communities had two or more schools to which children could walk. Scores on the School Location domain ranged from 9–15 of a possible 15 (AL $\bar{x}$ = 12, MS $\bar{x}$ = 15; Table 4). Amenities for physical activity were available in each community. The community Trails domain scores ranged from 0 in Wilcox County, AL to 16 in Bullock and Sumter Counties in AL and Panola County, MS (20 possible). AL and MS mean scores were both 10. All communities had access to parks or playgrounds with domain scores from 12 of possible 25 (Wilcox County, AL) to 18 (Panola County, MS) (AL $\bar{x}$ = 15, MS $\bar{x}$ = 16). Six of the eight communities had some access to water activities with domain scores from 0–5 (of 10 points possible) (AL $\bar{x}$ = 3, MS $\bar{x}$ = 4).. All communities had a recreational facility such as a recreational center, playing fields, roller skating, or at least one fitness center. The Recreational Facilities domain scores (maximum 30) ranged from 7 in Wilcox, AL to 19 in Humphreys and Yazoo, Mississippi, as well as Bullock and Sumter, AL. Grenada, MS had the highest domain score of 21. AL had mean scores of 14 (S.D.= 6) and MS mean score was 19 (S.D.= 2). Total Town Wide scores varied from a low of 34 in Wilcox County, AL to a high of 70 (of 100 possible) in Bullock, AL and Panola, MS. Total mean scores for AL were 54 (S.D.=17) and 64 (S.D.=5) for MS, although domain and total scores did not differ significantly between the two states.

Discussion

The built environment includes neighborhood characteristics that have the potential to facilitate or impede physical activity for recreational purposes in addition to active transport to school, work, or other non-leisure activities; however, there is a paucity of studies regarding the use of such resources in rural communities (Ferdinand et al., 2012). This study sought to identify environmental and policy factors that impact availability, access, and utilization of the built environment among rural residents of communities located in AL Black Belt and MS Delta counties. SSA results indicated that built environmental barriers to physical activity existed in all communities. AL communities showed more sidewalks, and better connectivity to other places and access to public and civic destinations to which residents can walk, though these features were only present in half of the AL communities. Of the segments assessed in AL and MS, however, the majority were rated as walkable and aesthetically pleasing.

The variability in access to sidewalks and shoulders seen in the current study is consistent with previous studies. Several studies of rural settings noted lack of sidewalks as barriers to

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physical activity (Aronson and Oman, 2004; Evenson et al., 2002; Eyler, 2003; Frost et al., 2010; Paluck et al., 2006; Wilcox et al., 2005). This may be a feature unique to rural communities and may be attributable to scattered residential patterns and lack of community development (Yousefian et al., 2009). In areas where other resources for physical activity are limited, access to sidewalks and shoulders could potentially provide an avenue for increased physical activity. Our study also found that most segments in communities contained safety features and were aesthetically pleasing. Proper safety features in rural communities may address concerns for safety. Safe venues for physical activity in rural settings are likely different than those in urban areas (Yousefian et al., 2009). Several studies have assessed the association of safety features such as street lighting with physical activity (Frost et al., 2010). These studies showed inconsistent associations between street lighting and physical activity (Addy et al., 2004; Eyler, 2003; Hooker et al., 2005; Sanderson et al., 2003; Wilcox et al., 2003; Wilcox et al., 2000). Additionally, aesthetic appeal of the built environment may increase the desire of rural residents to live an active lifestyle. Several studies have found positive associations between physical activity and perceived visual interest of the built environment (Boehmer et al., 2006; Deshpande et al., 2005; Wilcox et al., 2000) and pleasantness of communities (Boehmer et al., 2006; Deshpande et al., 2005; Kirby et al., 2007). Both safety features and aesthetics may promote the incorporation of physical activity in the daily routines of rural residents.

Based on our findings, the communities evaluated in this study lacked a strong base of policies and programs to support physical activity, particularly outside of policies and programs related to local schools. School-based policies, similar to the Mississippi Healthy Students Act (Center for Mississippi Health Policy, 2012; Southward et al., 2012), are commonly suggested to increase physical activity of children in school. Currently, 38 states mandate physical activity for school students (National Association for Sport and Physical Education and American Heart Association, 2012). Additionally, policies have been used to ensure that school facilities are available for community members to use; however, this is only true for approximately 29% of schools nationally (U.S.Department of Health and Human Services, 2010). We did, however, find overall town PPA scores to be higher, albeit still not extremely high, in Humphreys, MS and Bullock, AL, compared to other counties. While it is possible that there was a champion to advocate for policy change to support active living, to our knowledge, that was not the case. For example, if the mayor had run on a platform promising change, the local county coordinators who lived in the communities and completed the assessments would have known. It is more likely that the scores reflect more resources. The TWA identified parks and playgrounds as the most consistently available community feature. Although park and playgrounds are physically available in these communities, additional research is warranted on the community members' perception of safety, which has direct implications on whether these areas are actually used for physical activity. Policies such as requiring walkways and bikeways in new infrastructure projects remain scarce.

The RALA addresses the ecological approach to physical activity by incorporating factors that contribute to physical activity levels, such as individual behavior, social and physical environments, and policies (Sallis et al., 2006). Given the unique challenges faced by rural communities such as unhealthy nutritional habits, physical inactivity (Eberhardt et al.,

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2001), high prevalence of obesity (Befort et al., 2012), and chronic diseases (Jackson et al, 2013; Kinney et al., 2006; Lee et al., 2012; Massey et al., 2010; U.S. Department of Health and Human Services, 2014) efforts to identify facilitators and barriers and increase active living through targeted interventions and policy implementation in rural communities may decrease health disparities associated with insufficient physical activity (Yousefian et al., 2009). Findings from this study can be used to inform policy and program interventions targeting increased physical activity among rural residents. Additionally, these findings will serve as a baseline evaluation from which community members can assess changes in their local environment that may promote active living.

Strengths of this study are that comprehensive assessments of supports for physical activity in rural environments using an established measure were used; this study is among the first to address activity audits in rural communities; and community residents were used to collect data. The perceptions of residents who would be using these resources are relevant to future interventions targeting increased physical activity in these communities. Limitations are that we did not audit the entire community, but used the approach suggested to identify segments across four zone types within a certain geographic radius. However, community members confirmed the general representativeness of the segments assessed relative to others in the area. This study also did not evaluate associations between built environment and physical activity. Furthermore, audits were collected in rural counties in only 2 Southern states, limiting generalizability. Likewise, we were unable to compare our results to comparable rural communities due to the paucity of studies involving the impact of the built environment on rural communities. Finally, there was no assessment of community members' perceptions of the built environment. Such information could provide a more thorough understanding of current environmental and policy support for physical activity.

Rural communities face unique environmental and policy challenges that create barriers for residents to access and utilize the built environment (Barnidge et al., 2013). The disparity in availability, access, and utilization of the built environment resources in rural communities in comparison to urban communities may be due to small population sizes in rural settings that may limit funding for environment changes and support for state policies. In addition, due to sparse resources in rural areas, rural residents may not view physical activity as a priority, and therefore, may place less value in the availability of built environment resources (Barnidge et al., 2013). Therefore, understanding challenges that are inherent when attempting to plan, implement, and evaluate programs and interventions for increased physical activity in rural communities is essential.

Though health behavior change historically has largely focused on individual-level changes, a growing body of evidence now suggests that interventions at multiple levels (e.g., individual, environmental, and policy) are needed to promote physical activity. When making physical activity recommendations, thoughtful consideration must be given to the feasibility of meeting activity goals in the context of an individual's community setting. Our findings suggest that additional efforts are needed to improve the activity friendliness of rural communities in AL and MS. Built environment features (e.g., sidewalks and walkable shoulders), town programs and policies initiatives (e.g., requiring walking paths in new residential areas or opening school tracks for community after hours use), and townwide

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amenities (e.g., parks) can help to provide additional opportunities for members of rural communities to be more physically active.

Conclusion

Rural communities can be successfully assessed by community members using the RALA tools. The information provided about the utility and ease of the RALA is applicable to other populations and can provide support for similar studies to assess rural areas.

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Highlights

- Rural communities can be comprehensively assessed using established instruments
- The instruments used can be readily used by trained lay community members
- All rural communities assessed had built environmental barriers to physical activity
- Parks and playgrounds were the most consistently available rural community resource
- Data can be used to develop interventions, determine gaps, and compare rural communities

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TABLE 1

U.S. Census Characteristics for Deep South Network Research Counties, 2010–2011

	Perry AL	Bullock AL	Sumter AL	Wilcox AL	AL	Grenada MS	Humphreys MS	Panola MS	Yazoo MS	MS	U.S.
Population, 2010	10,591	10,914	13,763	11,670	**4,779,736**	21,906	9,375	34,707	28,065	**2,967,297**	**308,745,538**
Black Persons Percent, 2011	68.0%	69.5%	73.6%	72.2%	**26.5%**	41.8%	74.4%	48.9%	57.1%	**37.3%**	**13.1%**
High School Graduate or Higher, Percent Persons age 25+, 2007–2011	71.7%	72%	75.4%	72.4%	**81.9%**	76.3%	64.7%	72.8%	74.4%	**80.3%**	**85.5%**
Bachelor' s Degree or Higher, Percent Persons age 25+, 2007–2011	12.6%	14.4%	13.6%	12.0%	**22.0%**	17.2%	10.9%	14.0%	13.0%	**19.7%**	**28.2%**
Per Capita Income in Past 12 Months (2011$), 2007–2011	$14,283	$20,678	$14,122	$12,683	**$23,483**	$20,116	$13,448	$16,449	$14,730	**$20,521**	**$27,915**
Median Househol d Income, 2007–2011	$27,222	$31,955	$21,964	$23,750	**$42,934**	$33,123	$25,730	$34,592	$27,979	**$38,718**	**$52,762**
Persons below Poverty Level, Percent, 2007–2011	24.4%	26.0%	38.0%	36.7%	**17.6%**	22.5%	42.0%	28.1%	32.2%	**21.6%**	**14.3%**

NOTE: Source 2010 U.S. Census Bureau, 2011. Available at http://www.census.gov/2010census/

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Table 2

Selected Town Segment Characteristics for Neighborhood Walking using the RALA Segment Assessment by County and State, 2011

Segments Assessed	Perry, AL *n*=14	Bullock, AL *n*=16	Sumter, AL *n*=15	Wilcox, AL *n*=15	AL	Grenada, MS *n*=16	Humphreys, MS *n*=10	Panola, MS *n*=16	Yazoo, MS *n*=15	MS	TOTAL Sample
					n (%)						
Sidewalks present	5 (36)	4 (25)	3 (20)	6 (40)	**18 (30)**	5 (31)	1 (10)	4 (25)	3 (20)	**13 (23)**	**31 (27)**
Shoulders present	9 (69)	10 (63)	5 (33)	3 (23)	**27 (47)**	2 (13)	7 (70)	6 (38)	2 (15)	**17 (32)**	**44 (40)**
Other safety feature*	9 (69)	16 (100)	14 (93)	12 (86)	**51 (88)**	14 (88)	9 (90)	14 (88)	11 (73)	**48 (84)**	**99 (86)**
Connectivity to other places	10 (71)	10 (63)	14 (93)	6 (40)	**40 (67)**	1 (6)	4 (40)	2 (13)	3 (20)	**10 (18)**	**50 (43)**
Public & civic destinations	10 (71)	12 (75)	8 (53)	10 (67)	**40 (67)**	6 (38)	4 (40)	8 (50)	6 (40)	**24 (42)**	**64 (55)**
Commercial destinations	7 (50)	7 (44)	4 (27)	7 (47)	**25 (42)**	8 (50)	4 (40)	5 (31)	9 (60)	**26 (46)**	**51 (44)**
School destinations	5 (36)	4 (25)	0 (0)	4 (27)	**13 (22)**	1 (6)	1 (10)	7 (44)	3 (20)	**12 (21)**	**25 (21)**
Walkable Segment	12 (86)	11 (69)	13 (87)	8 (57)	**44 (75)**	11 (69)	7 (78)	10 (63)	13 (87)	**41 (73)**	**85 (74)**
Pleasing Aesthetics	14 (100)	13 (81)	14 (94)	11 (73)	**52 (87)**	14 (88)	8 (89)	13 (81)	15 (100)	**50 (89)**	**102 (88)**

Note:

*Traffic lights, stop signs, school flashing lights, speed bumps, or public lighting.

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Table 3

Town Program and Policy Assessment Domain and Total Scores by County and State, 2011

	Perry AL	Bullock AL	Sumter AL	Wilcox AL	AL* [range]	Grenada MS	Humphreys MS	Panola MS	Yazoo MS	MS* [range]	TOTAL* sample [range]	*p* value§
Town Policies	0	0	0	0	**0 (0) [0]**	0	10	0	0	**3 (2) [0– 10]**	**1 (4) [0–10]**	**0.32**
Town Programs	18	26	22	0	**17 (12) [0–26]**	26	30	18	18	**23 (6) [18–30]**	**20 (9) [0–30]**	**0.46**
School Policies	15	30	15	15	**19 (8) [15–30]**	30	15	30	15	**23 (9) [15–30]**	**21 (8) [15–30]**	**0.49**
School Programs	15	30	10	0	**14 (13) [0–30]**	10	30	0	10	**13 (13) [0–30]**	**13 (12) [0–30]**	**0.77**
Total PPA Score	48	86	47	15	**49 (29) [15–86]**	66	85	48	43	**61 (19) [43–85]**	**55 (24) [15–86]**	**0.66**

Note:

*Scores are expressed as means with standard deviations. The range of scores is included in brackets.

§Kruskal-Wallis tests used due to small samples within each state and non-normal distribution.

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Table 4

Town Wide Assessment Domain and Total Scores by County and State, 2011

	Perry AL	Bullock AL	Sumter AL	Wilcox AL	AL* [range]	Grenada MS	Humphreys MS	Panola MS	Yazoo MS	MS* [range]	TOTAL* sample [range]	*p* value§
School Location	10	15	9	15	**12 (3) [9–15]**	15	15	15	15	**15 (0) [15]**	**14 (3) [9–15]**	**0.13**
Trails	8	16	16	0	**10 (8) [0–16]**	8	8	16	8	**10 (4) [8–16]**	**10 (6) [0–16]**	**0.87**
Parks & Playgrounds	16	16	16	12	**15 (2) [12–16]**	16	16	18	16	**17 (1) [16–18]**	**16 (2) [12–18]**	**0.19**
Water Activity	1	4	5	0	**3 (2) [0–5]**	5	0	5	4	**4 (2) [0–5]**	**3 (2) [0–5]**	**0.55**
Recreation Facilities	10	19	19	7	**14 (6) [7–19]**	21	19	16	19	**19 (2) [16–21]**	**16 (5) [7–21]**	**0.22**
Total TWA Score	45	70	65	34	**54 (17) [34–70]**	65	58	70	62	**64 (5) [58–70]**	**59 (13) [34–70]**	**0.56**

Note:

*Scores are expressed as means with standard deviations. The range of scores is included in brackets.

§Kruskal-Wallis tests used due to small samples within each state and non-normal distribution.