



The relationship between children's physical activity and family income in rural settings: A cross-sectional study

Lesley Cottrell^{a,*}, Jennifer Zatezalo^a, Adriana Bonasso^a, John Lattin^a, Samantha Shawley^b, Emily Murphy^c, Christa Lilly^b, William A. Neal^a

^a West Virginia University, School of Medicine, USA

^b West Virginia University, School of Public Health, USA

^c West Virginia University, Extension Services, USA

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ABSTRACT

Objective. To examine potential differences in children's physical activity and parent support of their children's physical activity based on family income within the rural setting.

Methods. A cross-sectional survey of 566 parents of children (5–15 years-old; mean = 7.7 years; standard deviation = 2.4) living in rural West Virginia from 2010 to 2011 was conducted. Children were recruited and had participated in a school-based health screening program.

Results. Overall, parents from a rural setting reported that their children engaged in an average of five days of physical activity for at least 60 min. Upon closer examination, children from lower-income families engaged in more physical activity, on average, than children from higher income families per parent report (mean = 6.6 days, confidence interval 95% = 4.9–6.0 vs. middle-income mean = 5.0, confidence interval 95% = 4.4–5.3 and highest-income mean = 4.5, confidence interval 95% = 4.1–4.7; $p = .01$). Rural parents supported their children's physical activity in numerous ways. Parents with the lowest incomes were more likely than parents from higher income families to encourage their children to be active and use their immediate environment for play and to be directly involved in physical activity with their children. More affluent parents were more likely to transport their children to other activity opportunities than parents from the lower income brackets.

Conclusions. Lower income families may utilize their immediate environment and encourage activity among their children whereas more affluent families focus on organized opportunity more often than lower income families. These findings emphasize the need to conceptualize the role family income plays in physical activity patterns and the potential benefit it provides to some families.

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Introduction

In 2010, one in five children lived in poverty in the United States (Humes et al., 2011). A greater incidence of poverty is found in rural settings (i.e., sparsely populated small towns and open countryside) throughout the Southeast and Appalachian regions of the country where more than 35% of families in completely rural areas live in high-poverty regions; 4% of this population lives in "persistent-poverty" (i.e., 20% of population or more has lived in poverty over the last 30 years; USDA, 2014). Living in poverty has been shown to impact children's lifestyle behaviors and health outcomes. Specifically, children living in poverty are more likely to be less active than other children (Singh et al., 2010; Milteer et al., 2012).

Many studies have examined the association between family income and children's physical activity (PA) and have demonstrated that children living in poverty have limited access to resources and areas for play and PA than children whose families are producing higher incomes (Romero et al., 2001; Tandon et al., 2012). Findings, particularly from the inner city and suburban areas, have also shown that when children in poverty are exposed to resources and safe play areas, the areas are often perceived to be unsafe or not enriched (Goodway and Smith, 2005; Weir et al., 2006). Thus, disadvantaged children do not engage in PA and are not encouraged by their parents to utilize play environments for safety concerns.

Despite the alarming incidence of poverty in rural settings, there have been no investigations of the effect of family income on children's PA in these areas. Studies have shown a greater prevalence of obesity among rural children compared to urban and suburban children (Liu et al., 2012), but potential PA differences have not been investigated. Children living in rural poverty may not face the same safety concerns as their inner city counterparts, but may have limited PA for other

* Corresponding author at: West Virginia University, School of Medicine, Department of Pediatrics, WV Prevention Research Center, PO Box 9214, RCBHSC, Morgantown, WV 26506-9214, USA.

E-mail address: lcottrell@hsc.wvu.edu (L. Cottrell).

reasons. Furthermore, parents of children in the rural setting may support their children's PA differently.

The purpose of this study was to investigate potential differences in children's PA based on family income within the rural setting. We also examined potential means for explaining these differences, if found, through parental support of their children's PA. We hypothesized that within the rural setting, children living in poverty would experience limited resources and opportunities for PA and would subsequently engage in PA less often than children from more affluent family environments. Potential differences in parental support of PA based on family income within the rural setting were exploratory by nature, thus, we had no a priori hypotheses. An exploration of geographical factors associated with children's PA behaviors and parents' PA support within the rural setting based on family income is important and timely given the high prevalence of poverty and sedentary behaviors in rural areas compared to urban settings (Liu et al., 2008; Davis et al., 2010).

Methods

Sample recruitment and procedures

The study was conducted in 2010–2011 among children in kindergarten, and second, and fifth grade classrooms who were enrolled in the Coronary Artery Risk Detection in Appalachian Communities (CARDIAC) Project. The parents of children who had participated in the CARDIAC health screening at their schools received the behavior survey with their children's screening results in the regular mail with a postage-paid envelope for return to study investigators. Only one parent from a household was invited to participate. Details about the CARDIAC screening and survey methodology have been provided elsewhere (Cottrell et al., 2013). All study materials and procedures were approved by the West Virginia University Institutional Review Board.

Measures

In this study, we collected parent reports of their children's average PA throughout the academic year (September to June). Parents were also asked to report the frequency with which they support their children's PA in various ways.

Family income

Family income was assessed from parent-report of total family annual income after taxes were removed. Participating parents were asked to choose one of nine categories based on the U.S. Census collection method \$14,999 or lower, \$15,000 to \$24,999, \$25,000 to \$34,999, \$35,000 to \$49,999, \$50,000 to \$74,999, \$75,000 to \$99,999, \$100,000 to \$149,999, \$150,000 to \$199,999, and \$200,000 and over.

Children's physical activity (PA)

Children's physical activity (PA) was assessed by asking parents to report the number of days, in the past seven days, when their children exercised or were engaged in PA for at least 60 min each day. This item was modified from the Behavioral Risk Factor Surveillance System (BRFSS; CDC, 2013) for parent report on behalf of their small children. PA was defined in the survey instructions as any activity that, on a scale of 0 to 10 would be moderate (a 5 or 6) or vigorous (7 or 8) intensity using CDC approved descriptions. Parent report of their children's PA in a given time period using this BRFSS item has previously been associated with pedometer and accelerometer readings of children's activity in the same time period (CDC, 2014).

Parent support for their children's physical activity

Parent support for their children's physical activity was assessed using five items for PA support developed and originally explored by Trost and colleagues (Trost et al., 2003) and five additional items identified as commonly used support methods in the rural setting based on parent focus groups. The five items used by Trost and colleagues assessed the frequency by which parents supported their children's PA by: encouraging their children to do physical activities or play sports, encouraging their children to engage in PA or play sports with their children, providing transportation so their child could go to a place where he/she could do physical activities or play sports, watching their children participate in PA or sport, and telling their children that PA is good for their health. The five remaining parent support items used the same question format to ask parents how often they send their children outside to play, give their children PA options, praise their children for being physically active, use PA as a reward, and use PA as a punishment (see Table 1 for other items). Parents were able to respond in a range of 1 "never or almost never" to 5 "daily". The internal consistency of this modified parent support scale among this sample was measured by Cronbach's alpha at 0.85.

Statistical analyses

Descriptive statistics (mean, standard deviation) were calculated for sample characteristics including child age, gender, and family income. We explored potential differences in parent report of child's physical activity (0–7 scale), children's daily PA engagement (per parent report), and the forms of parent support of their children's PA with child age (4), gender (2), and grade (4) as the fixed factors within separate univariate analyses of variance (ANOVAs). Child age, gender, and grade were also entered into separate ANOVA models as covariate factors to examine the potential effects of family income on children's PA and parent support of their children's PA. Statistical significance was denoted at $p \leq .05$. Statistical analyses were performed using SPSS 20.0 in the spring of 2014.

Results

Sample characteristics

566 parents of 2477 (22.9%) eligible children enrolled in kindergarten ($n = 232$; 46.4%), and second ($n = 156$; 31.2%), fifth ($n = 84$; 16.8%), and eighth ($n = 28$; 5.6%) grade classrooms (5–15 years-old; mean = 7.7 years; SD = 2.4) completed the survey for inclusion in this study. Most of the parent respondents were mothers (89.1%). Slightly more than 30% of the represented children were either overweight (14.8%) or obese (16.2%) based on their body mass index percentiles (BMI%) from the CARDIAC Project health screening. Forty-six percent of the children were female. Family income was distributed across the census divisions with 16.2% of families reporting $\leq \$14,999$ annually, 20.2% reporting incomes between \$15,000 and \$34,999, 28.9% of families reporting incomes between \$35,000 and \$74,999, and the remaining 34.5% of families reporting incomes $\geq \$75,000$.

Parent reports of children's physical activity and parent support

On average, parents perceived their children as being highly active (mean 5.7 on a scale of 1 to 7). Overall, parents also reported that their children engaged in PA for 60 min or more, a total of five days in an average week. While parent report of children's PA using either measure did not significantly differ by child age, gender, or grade (see Table 1), parents of older and female children reported less PA.

Ways in which parents reportedly supported their children's PA varied in this sample. The most commonly endorsed forms of parent

Table 1

Univariate analyses of variance (ANOVA) results comparing parent report of their children's weekly physical activity and activity level based on child age, gender, grade enrollment, and overall sample.

| Parent report variable | Range of parent report (N) | Mean (Standard deviation) of parent report | Child age | | | | Child gender | | Child grade | | | |
|---|----------------------------|--|---------------------|---------------------|---------------------|----------------------|---------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) | Female (Std. error) | Male (Std. error) | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) |
| | | | 5–6 years (n = 165) | 7–8 years (n = 107) | 9–11 years (n = 86) | 12–14 years (n = 28) | (n = 250) | (n = 253) | K (n = 232) | 2nd (n = 156) | 5th (n = 84) | 8th (n = 28) |
| # of days in a week when child was physically active ≥ 60 min | 0–7 (n = 566) | 4.99 (1.8) | 5.18 (.15) | 4.74 (.23) | 4.85 (.27) | 3.66 (.37) | 4.66 (.19) | 4.80 (.19) | 5.18 (.15) | 4.72 (.28) | 4.92 (.22) | 3.66 (.38) |
| Perception of child's physical activity level | 1–7 (n = 550) | 5.71 (1.3) | 5.86 (.11) | 5.59 (.17) | 5.57 (.19) | 4.75 (.26) | 5.44 (.13) | 5.61 (.13) | 5.86 (.11) | 5.48 (.20) | 5.72 (.16) | 4.75 (.26) |

support were encouraging children to be physically active (mean 4.24, SD = .85), telling children that PA is good for their health (mean 4.04, SD = 1.04), and sending child outside to play (mean 3.95, SD = 1.10). Parent support for children's PA very rarely differed by child age, gender, and grade (see Table 2). Parents of 12 to 14 year-olds were less likely than parents of 9 to 11-year-olds to use physical activity as a punishment (p = .02). Furthermore, parents of male children were more likely than parents of female children to use physical activity as a reward (p = .04).

Children's physical activity differences by family income

Significant differences were found in the number of days their children engaged in PA for at least 60 min each day (F = 4.50, df = 3, p = .00, partial eta² = .02) based on family income after controlling for child gender and age. Fig. 1 displays the mean reports based on the four income brackets in this study. Specifically, pairwise comparisons revealed significantly greater children's PA (greater average days of ≥ 60 min of activity) among low-income families (≤\$14,999)

than all other categories. There were no significant differences among the remaining income brackets for the average number of days with ≥ 60 min of activity.

Parent support of children's physical activity by family income

Select forms of parent support (for their children's PA) significantly differed by family income including: transporting child to physical activity opportunities (p = .045), sending child outside to play (p = .014), praising child for being physically active (p = .007), taking part in physical activity with child (p = .05), and telling child that PA is important for his/her health (p = .001). The pattern of the family income effect differed greatly by form of support as well (Fig. 2). For instance, parent praise for being physically active and telling the child that PA is important decreased linearly as family income increased. Transporting child to PA opportunities and taking part in PA with child were the greatest among parents in the lowest and highest incomes but dropped in use among the middle-income brackets.

Table 2

Univariate analyses of variance (ANOVA) comparisons of parent support for children's physical activity based on child age, gender, grade, and overall sample.

| Type of parent support for child's PA | Overall sample range and N | Overall sample Mean (Std. deviation) | Child age | | | | Child gender | | Child grade | | | |
|--|----------------------------|--------------------------------------|---------------------|---------------------|---------------------|----------------------|---------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) | Female (Std. error) | Male (Std. error) | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) | Mean (Std. error) |
| | | | 5–6 years (n = 165) | 7–8 years (n = 107) | 9–11 years (n = 86) | 12–14 years (n = 28) | (n = 250) | (n = 253) | K (n = 232) | 2nd (n = 156) | 5th (n = 84) | 8th (n = 28) |
| Encourage physical activity | 1–5 (n = 556) | 4.24 (.85) | 4.25 (.08) | 4.40 (.12) | 4.15 (.13) | 3.80 (.20) | 4.08 (.09) | 4.29 (.09) | 4.25 (.08) | 4.47 (.13) | 3.99 (.12) | 3.80 (.20) |
| Transport child to be active | 1–5 (n = 552) | 2.94 (1.09) | 2.78 (.10) | 3.07 (.15) | 3.07 (.16) | 3.39 (.26) | 3.14 (.11) | 2.94 (.12) | 2.78 (.10) | 3.05 (.16) | 3.09 (.15) | 3.39 (.26) |
| Send child outside to play | 1–5 (n = 550) | 3.91 (.99) | 3.89 (.09) | 4.15 (.14) | 3.99 (.15) | 3.05 (.23) | 3.73 (.10) | 3.98 (.11) | 3.89 (.09) | 4.27 (.15) | 3.80 (.13) | 3.05 (.23) |
| Give child physical activity options | 1–5 (n = 549) | 3.66 (1.10) | 3.63 (.10) | 3.69 (.15) | 3.66 (.16) | 3.11 (.25) | 3.54 (.11) | 3.61 (.12) | 3.63 (.10) | 3.70 (.16) | 3.64 (.15) | 3.11 (.25) |
| Praise child for being physically active | 1–5 (n = 554) | 3.95 (1.10) | 3.85 (.10) | 4.19 (.15) | 3.85 (.16) | 3.03 (.26) | 3.79 (.11) | 3.82 (.12) | 3.85 (.10) | 4.06 (.16) | 3.93 (.15) | 3.03 (.26) |
| Use physical activity as a reward | 1–5 (n = 551) | 2.48 (1.44) | 2.70 (.13) | 2.79 (.20) | 2.50 (.21) | 1.82 (.34) | 2.31 (.15) | 2.74* (.16) | 2.70 (.13) | 2.74 (.21) | 2.50 (.19) | 1.82 (.34) |
| Use physical activity as a punishment | 1–5 (n = 551) | 1.10 (.48) | 1.05 (.03) | 1.06 (.05) | 1.21 (.05) | 1.03* (.09) | 1.13 (.04) | 1.08 (.04) | 1.06 (.03) | 1.15 (.06) | 1.14 (.05) | 1.03* (.09) |
| Take part in physical activity with your child | 1–5 (n = 553) | 3.06 (1.07) | 3.16 (.09) | 3.05 (.14) | 2.89 (.15) | 2.25 (.24) | 2.96 (.10) | 2.83 (.11) | 3.16 (.09) | 3.04 (.15) | 2.86 (.14) | 2.25 (.24) |
| Watch child play sports or be physically active | 1–5 (n = 557) | 3.48 (1.05) | 3.39 (.09) | 3.54 (.14) | 3.53 (.15) | 3.18 (.24) | 3.40 (.11) | 3.48 (.11) | 3.39 (.10) | 3.48 (.15) | 3.60 (.14) | 3.18 (.24) |
| Tell child that physical activity is good for his/her health | 1–5 (n = 557) | 4.04 (1.04) | 4.02 (.09) | 4.22 (.15) | 4.17 (.16) | 3.56 (.25) | 3.93 (.11) | 4.16 (.11) | 4.02 (.09) | 4.17 (.16) | 4.21 (.14) | 3.56 (.25) |

Note. * p < .05.

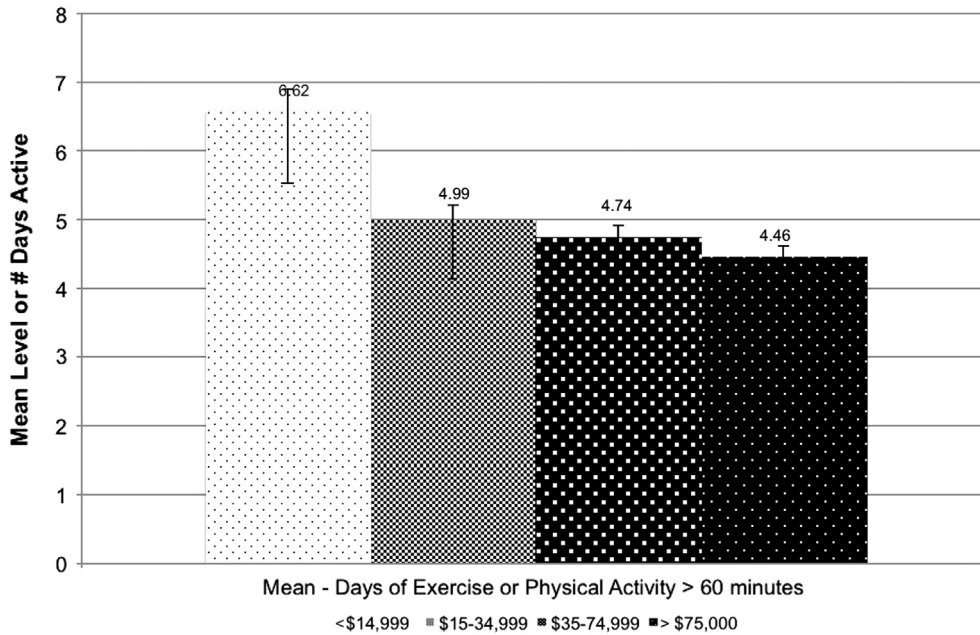


Fig. 1. Mean parent reports of children's physical activity based on family income.

Discussion

The major findings of this study were that overall PA of children from a rural environment averaged about five days of at least 60 min of daily physical activity, that children from low-income families engaged in greater amounts of physical activity than children from other income levels, and that the parents from low-income families provided more support of their children's PA by sending their children outside to play, praising their children for being active, taking part in PA with their children, and telling their children that PA is important than parents from other income levels. Our findings revealed surprising differences in the comparisons of children's PA compared to existing literature. Despite consistent evidence that poverty is associated with less PA among children in urban and suburban areas (Wolch et al., 2011), our findings suggest that children in rural settings living in poverty engaged in more PA than their rural peers from higher income brackets.

Furthermore, children from the most affluent families engaged in the least amount of PA based on parent report when measured in daily units of ≥ 60 min of activity.

Kimbro, Brooks-Gunn, and McLanahan (Kimbro et al., 2011) found differences in children's PA based on family income but within a large urban sample of children. Specifically, they found that children living in public housing were more likely to play outdoors. The authors point to select qualitative research (Lareau, 2003) that highlights differences in child-rearing philosophies as a result of family income variations. Specifically, Kimbro and colleagues (Kimbro et al., 2011) postulate that while safety may be a greater issue in the public housing areas, the structure of the day and mitigating circumstances may allow for parent supervision and/or involvement while the child plays outdoors. More research would be needed to assess the specific parental support strategies within the rural setting; however, our preliminary findings also highlight greater direct parent involvement in children's PA

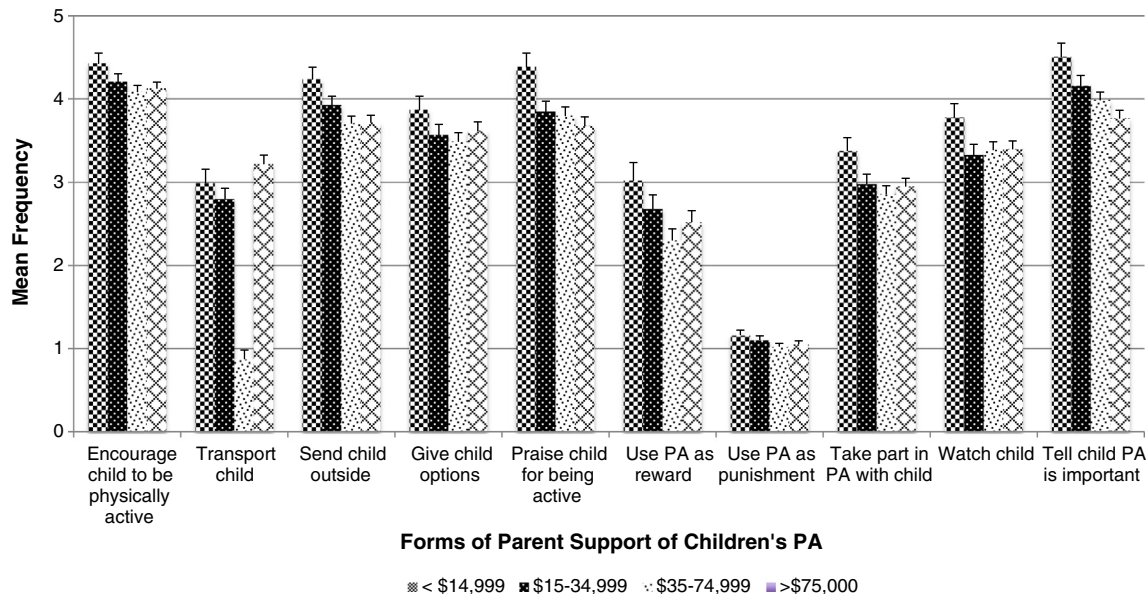


Fig. 2. Multivariate analyses of variance comparisons of parent support of children's PA based on family income.

among the lower income families in the rural setting. Collectively, these findings hint to a potential PA benefit for children living in settings that are commonly characterized as being highly restrictive in resources and benefits. When developing programs to improve children's PA, it would be important to incorporate their existing PA patterns before assuming that their PA is low at the beginning. If the PA quantity is the highest among their peers within poverty, the focus may, instead be shifted to the quality of the PA.

A second interesting finding in this study was the disparity found in parent support of their children's PA based on income levels. Again, parents living in poverty were more likely to encourage their children to be active and to play outside. These parents were also more likely to provide PA options and participate directly in activities with their children than parents of other income levels. In some instances, our findings were non-linear illustrating that parents of poverty and affluence supported their children in select ways more than those within the middle-income brackets. Considering the lifestyles of middle-income families within the rural setting in terms of their employment, marital status, and family structure compared to families at the extreme ends of the income range will be important to fully understand how to best intervene with these groups in the future. For instance, health economic researchers have demonstrated that the middle class is most affected by rising costs for food, education, recreation, and health care (Brinkman et al., 2010; Ladd, 2012). This is partially due to a closing income disparity between the lower and middle classes coupled with a lack of income-based benefits (Ravallion, 2010; Lund et al., 2011).

Existing studies have noted that families in poverty provide more unstructured time for their children to which the children respond with increasing sedentary behaviors (Fernandes and Sturm, 2011; Milteer et al., 2012; Tandon et al., 2012). Although our findings revealed greatest activity among the lowest income families, that time may be unstructured in nature and similar to findings from other studies. Despite the pattern in other forms of parental support, parents from the most affluent group were most likely to transport their children to physical activities than parents from other income brackets. This finding may contribute the disparities in childhood obesity based on family income variations. That is, although disadvantaged parents are more encouraging of PA and more directly involved, some of these physical activities may be limited in quality. In contrast, more affluent parents may be less directly involved in their children's physical activities but are able to transport them to other opportunities that arguably may offer more enriched experiences. Studies have demonstrated the additive benefits of PA within enriched environments over simply engaging in an independent activity (Best, 2010; Kempermann et al., 2010).

In this study, we controlled for child age and gender based on the cumulative evidence that children's PA levels change as children get older and vary between boys and girls. Our sample of children represented a large developmental range, which may have been affected differently by family income. Family size was also not factored into the analyses of family income and would need to be incorporated into future studies. We were also unable to investigate the impact of family income over time with our cross-sectional sample. Another limitation to this study was the use of parent report to assess their level and type of support, their child's PA, and their income descriptions. Finally, while the entire sample was recruited from the rural setting, portions of this setting are more metro than others. Comparing children's PA within the various income distinctions of the rural setting will be important not only to understand potential differences in the quality of opportunities to engage in PA, but also potential parental support differences as a function of geographic barriers that may make the environment more isolated than other rural settings. For instance, some rural areas may be mountainous and have limited or no playgrounds or other structured play areas while other rural areas are smaller metro areas with some community structures.

In conclusion, we believe that the present findings contribute to the existing literature on the influence of family income on children's PA levels and parent support of those activities and offer several implications for clinical practice. Our findings illustrate the need to avoid making the assumption that living in poverty is associated with little to no PA. Disadvantaged parents may recognize the value of PA and may already be implementing healthy behaviors with their children by encouraging them to use their immediate environments. Instead, the focus should be on the quality of those experiences. In addition, more attention should be directed to middle class families. Within the rural setting, these families may experience contradicting forces that place limits on their time, energy, and finances that influence their child rearing practices and direct involvement with their children's PA that the lowest and highest income families do not experience.

Conflict of interest statement

The authors declare that there are no conflicts of interest.

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