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Obesogenic environments in tribally-affiliated childcare centers and corresponding obesity rates in preschool children

Susan B. Sisson [a,*], Ji Li [b], Julie A. Stoner [b,c], Karina R. Lora [a], Janis E. Campbell [b], Sandra H. Arnold [d], Beth DeGrace [d], Diane Horm [e], Lancer Stephens [c,f,g]

[a] Department of Nutritional Sciences, College of Allied Health, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States
[b] Department of Biostatistics and Epidemiology, College of Public Health, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States
[c] Oklahoma Shared Clinical and Translational Resources, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States
[d] Department of Rehabilitation Sciences, College of Allied Health, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States
[e] Early Chyildhood Education Institute, University of Oklahoma, Tulsa, OK, United States
[f] Department of Health Promotion Sciences, College of Public Health, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States
[g] American Indian Diabetes Prevention Center, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States

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ABSTRACT

Background: Determine the relationship between obesogenic characteristics of childcare and child adiposity in tribally-affiliated centers in Oklahoma. Methods: The two-day Environment and Policy Assessment and Observation (EPAO) included a total environment (TE), nutrition (N), and physical activity (PA) score and took place in 11 centers across Oklahoma. Eighty-two preschool children (3-5 years) participated. Child height and weight were measured and overweight status (≥85th percentile for age and sex) was determined. Regression models, fit using Generalized Estimating Equations methodology to account for clustering by center were used and adjusted for center characteristics. Results: Participants were 3.8 (0.8) years old, 55% male, 67% American Indian (AI) and 38% overweight. A healthier TE and PA was associated with a reduced odds of overweight, which remained significant after adjusting for some center characteristics, but not all. A healthier TE, N, and PA was associated with lower BMI percentile, which remained significant after some center-level adjustments, but not all. Lower sedentary opportunity and sedentary time were no longer associated with reduced odds of overweight following adjustment. Lower opportunity for high sugar and high fat foods and minutes of active play were associated with reduced odds of overweight in some adjusted models. Conclusions: Collectively unadjusted and adjusted models demonstrate that some aspects of a healthier childcare center environment are associated with reduced odds of overweight and lower BMI percentile in preschool children attending tribally-affiliated childcare in Oklahoma. Future research should examine the association of childcare and health behaviors and further explore the role of potential confounders.

Introduction

During 2011–2012, 8.4% of 2-to-5-year-old U.S. children (i.e., young children) were reported to be obese (Ogden et al., 2014). In the most recently available data for Oklahoma (i.e., 2010), preschool children have a higher obesity prevalence of 14.3% which has increased from 13.1% in 2005 (Weedn et al., 2014). An ethnic disparity is also present in North America such that American Indian (AI) children have higher odds of obesity (Weedn et al., 2012; Schell and Gallo, 2012; Katzmarzyk, 2008). Following California, Oklahoma has the second highest overall number of AI residents (United States Census Bureau, 2012) which constitutes 13% of the Oklahoma's total population (United States Census Bureau, 2010). Children who are overweight and/or obese are reported to have significant health effects, including cardiovascular and metabolic diseases (Dietz, 1998) which can persist into adulthood (Freedman et al., 2005; Singh et al., 2008) and predict adult onset cardiovascular disease (Janssen et al., 2005). Interventions to prevent obesity in young children have focused on diet, physical activity, and sedentary behaviors which contribute to overall energy intake or expenditure (Hesketh and Campbell, 2010).

Recent reviews (Trost et al., 2010; Ward et al., 2010; Larson et al., 2011) and reports (American Academy of Pediatrics et al., 2012; Institute of Medicine Committee on Obesity Prevention Policies for Young Children, 2011) indicate that childcare centers can be effectively targeted for obesity-prevention interventions (Story et al., 2006). Many

* Corresponding author at: Behavioral Nutrition and Physical Activity Laboratory, Department of Nutritional Sciences, University of Oklahoma Health Sciences Center, 1200 N Stonewall Ave, AHB 3068, Oklahoma City, OK 73117-1215, United States.
E-mail address: susan-sisson@ouhsc.edu (S.B. Sisson).

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children spend a substantial amount of time at childcare weekly. In Oklahoma, 58% of children under six years of age attend childcare (Oklahoma Child Care Resource and Referral Association, Inc., 2012). Those children with full-time working mothers, with full-time defined as working ≥35 h/week, spend an average of 38 h/week in non-parent child care (Mulligan et al., 2005). Several studies have examined obesity prevalence in children attending childcare (Belfield and Kelly, 2013; Benjamin et al., 2009; Geoffroy et al., 2013; Gubbels et al., 2010a; Kimbro et al., 2007; Lin et al., 2011; Lumeng et al., 2005; Maher et al., 2008; McGrady et al., 2010; McLaren et al., 2012; O'Brien et al., 2007; Pearce et al., 2010; Rapp et al., 2005; Zahir et al., 2013; Mandal and Powell, 2014). Although not all studies agree (Belfield and Kelly, 2013; Kimbro et al., 2007; Lumeng et al., 2005; O'Brien et al., 2007; Rapp et al., 2005; Zahir et al., 2013; Mandal and Powell, 2014), it has been reported that children attending childcare are more likely to be overweight. (Geoffroy et al., 2013; Gubbels et al., 2010a; Maher et al., 2008; McGrady et al., 2010) This is likely a complex relationship, given the variability in childcare environment, child exposure and the child's home environment. There is substantial variation in obesogenic characteristics of childcare centers (Cradock et al., 2010; Benjamin et al., 2008; Kaphingst and Story, 2009; Vanderloo et al., 2012). In Oklahoma, childcare centers are subjected to limited regulations regarding nutrition and physical activity (PA) (Oklahoma Department of Human Services, 2013), thus variation would also be likely.

To most appropriately develop interventions, we need to understand the characteristics of the environment that are associated with overweight and obesity. The relationship of obesogenic childcare environments and the specific attributes of the classroom, center, and teacher interactions to overweight and obesity is relatively unreported (Vanderloo et al., 2014; Bower et al., 2008; Lyn et al., 2013; Gubbels et al., 2010b), and has not been examined among childcare that serve high-risk AI populations. Previous studies have demonstrated the physical activity and/or nutrition environment is associated with child health behaviors. (Vanderloo et al., 2014; Bower et al., 2008; Lyn et al., 2013; Gubbels et al., 2010b) However, they have not examined the combined obeseogenic environment nor the association with weight status. Tribally-affiliated childcare are facilities supported by different AI tribes and predominately serve AI children although not all children are required to be of AI descent to enroll. The purpose of this study was to determine the relationship between obesogenic characteristics of classrooms and child overweight and obesity among tribally-affiliated childcare in Oklahoma. It was hypothesized that children attending centers with less obesogenic environments would have lower adiposity, as determined by body mass index percentile and overweight classification.

Materials and methods

Study design and participants

This was a cross-sectional descriptive study of 11 AI tribally-affiliated childcare centers that provide all-day care and prepare a substantial meal (i.e., lunch) to preschool age (3–5 years) children across Oklahoma. All parents/guardians of 3–5 year old children receiving services (n = 286) were invited to participate in the project. One hundred thirty seven (48%) parents/guardians of the invited children returned a signed consent form. Eighty-two children were present on days of observation and were included in the analysis. Data were collected in 2012 and analyzed between 2013 and 2015. The University of Oklahoma Health Sciences Center, Indian Health Services, and specific participating tribes' ethics committees all approved this protocol.

Tribally-affiliated centers were recruited via telephone from the Oklahoma Tribal Child Care Association roster. Centers were located across Oklahoma, however, all were located in rural areas. There is currently a lack of standardization across all childcare in Oklahoma pertaining to health curriculum, staff training on health, or facilities and equipment. All participated in the Child and Adult Care Food Program (CACFP) which requires minimum portions and nutrient quality. Attempts were made to contact all 38 tribal child care programs within the state; 10 programs could not be contacted; 13 programs were not eligible as they did not have a facility or did not care for preschool-age children; eight programs were interested but conflicts arose with scheduling; and seven programs representing 11 centers were successfully recruited. A two-consecutive day environmental observation was conducted in all centers, including the preschool classroom(s), the lunch room if separate from the classroom, and outdoor and indoor play areas. One center had three classrooms, separated by age. Two centers had two preschool classrooms with mixed age grouping. The remaining eight centers had one classroom for children of all eligible ages.

Measures

Environment and Policy Assessment and Observation Instrument (EPAO)

The observation component of the Environment and Policy Assessment and Observation Instrument (EPAO) was used (Ward et al., 2008). The instrument consists of a full-day observation; inter-rater observations have been reported to be sufficient (87.3% agreement) (Ward et al., 2008). Researcher training consisted of several hours of classroom training and, at minimum, two days of field training. Before researchers could observe independently, agreements between classroom comparisons of trainees and a master observer, trained by EPAO instrument developers, were reached. As questions arose, the research team discussed these for consistency in scoring. Six observers contributed to classroom observations over the course of the study. Following training, percent agreement across observers was not determined. The document review component of the EPAO was not included to reduce burden for center directors.

The EPAO includes 64 individual items and is described elsewhere (Ward et al., 2008). Those individual items are integrated into six nutrition subscores and five PA subscores (Table 1). The item responses on the EPAO observation were converted from their raw response to a 3-point score (0, 1, and 2) with higher scores for more desired characteristics, averaged within a given subscale, and multiplied by 10, with the average of all subscale scores representing the respective nutrition or PA score (Ward et al., 2008). The nutrition and PA scores were summed to create the total environment score. Environment scores were averaged across both days of observation for analyses. A higher value for each scale indicated a more healthful, less obesogenic environment, including opportunities for sedentary activity and sedentary environment

Time in activity and activity bouts

In addition to the EPAO observation and subsequent score development, the total time spent in sedentary activities, TV viewing, active play, outdoor active play, number of PA bouts, and structured PA were recorded using a digital wrist watch. Sedentary time included TV viewing and other seated activities. Active play included free play outdoors and indoors and did not include structured PA led by teachers or staff. Structured PA was exclusive of outdoor time and active play. Structured PA was not included in outdoor time or active play time, since the activity was teacher-led and children did not have a choice to participate or not. Time in activity and activity bouts were averaged across both days of observation.

Weather

The daily high temperature and presence of precipitation were recorded for each day of observation. Weather was a hypothesized extraneous factor in EPAO scores due to potentially lower outdoor time and participation in physical activity (Tucker and Gilliland, 2007; Carson and Spence, 2010). The daily temperature high for the location was recorded by the observer using reliable smart phone weather application.