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RESEARCH ARTICLE

Challenges and Best Practices in BMI Screening in Head Start: One Program's Perceptions

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Body mass index (BMI) for age is an important screening tool utilized to track growth patterns in children and identify potential health risks. Head Start conducts BMI screenings to combat early childhood obesity. To adequately conduct surveillance over time and evaluate obesity prevention interventions implemented in HS programs, an examination of the raw measurement data and discussion with HS programs related to needs around the data collection process is important. The purpose of this study was to describe findings from the examination of raw height and weight data at two time points and explore the perceptions of health staff around the data collection process prior to the implementation of an obesity prevention/health promotion initiative. Best practices for BMI screening are discussed.

Keywords: early childhood education, obesity, Body Mass Index, measurement, screening

INTRODUCTION

In the United States, nearly 13.7 million individuals are affected by obesity, and in 2015-2016, 13.9 percent of preschoolers (2-5 years old) had obesity (Hales et al, 2017). The prevalence of obesity in Head Start preschoolers was 16.6% in 2018, with a range across states from 12.5 to 27.1 percent (Imoisili et al., 2020). Lowering obesity rates among children is among the nation's public health goals outlined in *Healthy People 2030* (Office of Disease Prevention and Health Promotion, 2020). Preschoolers who are overweight or obese are five times as likely to be overweight or obese by the age of 12, and are more likely to become overweight or obese as adults (Centers for Disease Control and Prevention [CDC], 2013). Additionally, childhood obesity has both immediate and long-term implications related to physical, social, and emotional health (Freedman et al, 2007; Griffiths et al, 2010; May et al., 2012 & Must et al, 2006). Body mass index (BMI) for age is an important screening tool utilized to track growth patterns in children and identify potential health risks (Bell et al., 2018; CDC, 2020). Early Care and Education programs have been identified as

ideal locations for obesity prevention initiatives and evaluation (Institute of Medicine, 2013) . However, surveillance systems are needed to monitor obesity prevalence at the program level where prevention efforts may be implemented (Hales et al., 2017; Hoelscher et al., 2017). More specifically, Head Start program reports could serve as a source of obesity surveillance data in low-income preschoolers, where overweight and obesity remains high (Imoisili et al., 2020).

Head Start (HS) is a national early childhood program, serving over one million low-income children in the US to promote school readiness and provide nutrition, health, and social services (US Department of Health and Human Service [USDHHS], 2016). Federal funding regulations require HS programs to screen BMI-for-age among children and annually report aggregate weight categorization (i.e. underweight, normal weight, overweight, obese) to the USDHHS (Office of Head Start, 2020). Program level policies and procedures outline a general protocol for nutrition assessments, inclusive of height, weight, and BMI collection and reporting, and parental notification and follow-up. HS Performance Standards require programs to actively engage in obesity prevention efforts in the classroom and through family partnerships (USDHHS, n.d.). In the 2016 Head Start Health Manager Descriptive Study (Karoly et al., 2016) nearly 86 percent of programs identified obesity as a major concern, in which 45 percent reported spending more than a half a day per week addressing obesity-related issues and prevention efforts. Additionally, the study reported that 80% of programs obtained these height and weight measurements on-site and 72% used height and weight as an outcome measure to monitor health promotion activities.

To adequately conduct surveillance over time and evaluate obesity prevention interventions implemented in HS programs, an examination of the raw measurement data and discussion with HS programs related to needs around the data collection process could provide valuable insight. Since data reported to the USDHHS is aggregate, examining the raw data over time at a program level may provide insight into potential needs and best practices around this process in HS. To date, this has not been reported in the literature. Considering that HS serves more than one million children each year, they have the potential to impact child health and, in particular, prevention of overweight and obesity. Research has shown that HS participants have healthier eating patterns, healthier BMIs, and are at lower risk of being obese or overweight (Lee et al., 2013; Lumeng et al, 2015). One study previously conducted with HS has demonstrated benefits to child weight status, in which enrolled HS preschool-aged children with an unhealthy weight status showed a significantly healthier BMI by kindergarten in comparison to non-HS preschoolers (Lumeng et al., 2015).

Given that an examination of raw measurement data over time and discussions with HS programs related to needs around the data collection process has not been previously reported in the literature, the purpose of this study was to 1) examine and compare raw height and weight data of preschoolers in one program at two time points during the school year and 2) explore the perceptions of health staff around the data collection process prior to the implementation of an obesity prevention/health promotion initiative.

METHODS

Study Design & Procedures

The study design included secondary data analysis of height and weight data collected by HS teachers and one focus group with the HS health team including the health and nutrition managers, nutrition specialist, and site health staff. Head Start Performance Standards (USDHHS, n.d.) do not explicitly designate the persons responsible for height and weight measurements, therefore this is decided at the program level and often influenced by available resources. In this HS program, teachers were identified as the personnel responsible for annual child measurements.

Forty-six teachers across 13 HS sites in one program collected height and weight measurements of 455 enrolled preschoolers at two times points: at the start of the school year (August) and six months later (February). Each Head Start site received the same digital scale (Health-O-Meter electronic self-calibrating digital scale) and stadiometer (Secca 213 portable stadiometer). At the beginning of the school year, a 60-minute mandatory, all-staff, lecture-style nutrition training was conducted by the HS nutrition manager and included nutrition information, menu/meal guidelines, and instructions on how to use the stadiometer and scale for child measurements. The bulk of the training included information and updates on nutrition guidelines with approximately ten minutes addressing the BMI screening. Verbal instructions regarding strategies for conducting school-based anthropometric measurements as recommended by the CDC (2018), including removing shoes, hair accessories, and coats/jackets during measurements, were provided. Teachers recorded the height and weight measurements for each time point on a spreadsheet that was returned to the nutrition manager. For each time point measurement, the nutrition manager entered the height and weight into the ChildPlus data management system, which calculated the BMI-for-age percentile and weight classification according to the CDC guidelines (2000). All data was then sent to the HS program data and monitoring coordinator.

A 60-minute focus group (FG) with the ten members of the HS health team was conducted at the central early childhood education center by trained qualitative researchers to better understand their perceptions and practices around the height and weight measurement collection. The FG attendees included the program-level nutrition staff and nursing/health staff who provided services to all HS sites and training for the height and weight measurements. The FG guide was jointly created by the research team and the health advisory committee of the HS program and was reviewed by outside experts. Three overarching questions guided the focus group: 1) What is the process your program uses to collect the height and weight of preschoolers in your program? 2) Who is responsible for conducting the measurements? 3) What are some of the challenges around data collection?

Data Analysis

The research team received the de-identified paired height, weight, BMI-for-age, weight classification and each child's gender and age. A paired t-test was used to examine statistical differences for height, weight, and BMI percentiles. Height and weight of paired data were also examined and categorized based on typical growth patterns for children over a 6-month period [1-

1.5 inch gain in height/2.5-pound gain in weight over 6 months]. The categorization of the paired heights and weights were defined as 1) a loss of height or weight or no change in either height or weight, 2) typical growth for a preschool-age child [1-1.5 inches in height/2.5-pound gain in weight in 6 months], or 3) an increase greater than 3-inches in height, and 5-pounds in weight in 6 months (Hockenberry et al, 2016). BMI percentiles were examined for changes in categorization for each child over the 6-month period. BMI percentiles were not transformed to BMIz scores due to research indicating that BMIz levels in children with severe obesity and similar BMI percentile could differ by more than one standard deviation attributable to differences in age or sex (Friedman et al., 2017). SPSS was used for all data analysis (IBM Corp, 2017)

The focus group was audio recorded and transcribed verbatim. Two qualitative researchers independently coded the transcript using constant comparative analysis (Lincoln & Guba, 1985), compared results, and reached consensus on all codes. Codes were organized into themes and sample quotations were assigned for each theme.

RESULTS

Secondary data were collected from children at 13 HS sites (n=455) in one program, of which 51% were male. Table 1 reports the mean changes in height, weight, and BMI percentile from time 1(August) to time 2 (February). During the 6-month period children significantly increased in height ($p < 0.001$), and weight ($p < 0.001$), growing on average 1.36 inches and gaining 2.01 pounds, however their BMI for age percentiles significantly decreased by 3.99 points ($p = 0.002$).

TABLE 1

Change in Head Start Preschoolers' Health Indicators

Variable	Time 1 m(SD)	Time 2 m(SD)	p-value	Effect Size (partial eta squared)
Height (inches)	41.11	42.27		
	(2.49)	(2.71)	<0.001	0.512
Weight (pounds)	39.98	41.99		
	(7.27)	(8.06)	<0.001	0.279
BMI (percentile)	64.92	60.93		
	(29.03)	(31.20)	0.002	0.021

Note. Time 1 = August 2015, Time 2 = February 2016

Table 2 provides a summary of height and weight changes and identifies cases of no growth or declines in growth, normal growth, and extreme growth. Overall, there were 58 (12.7%) changes in height that were of concern with 39 (8.6%) children losing height or not exhibiting height growth, and 19 (4.2%) children growing over 3 inches during this 6-month period. There were also 164 (36%) changes in weight that were of concern, with 104 (22.9%) children losing weight or not exhibiting weight growth, and 60 (13.2%) gaining greater than 5 pounds. When taken together, 260 (57.1%) measurements indicated normal growth across the two time points, 168 (36.9%) had

concern over one measurement, and 27 (5.9%) children had a concern for both a height and weight measurement.

TABLE 2

Frequency of Change in Head Start Preschoolers Health Indicators

Measurement	Decrease/No Change			Normal Growth			Extreme Growth		
	f	(% of total)	range	f	(% of total)	range	f	(% of total)	range
Height (inches)	39	8.6%	[0-5.5]	397	87.3%	[0.2-2.5]	19	4.2%	[3.5-10.3]
Weight (pounds)	104	22.9%	[0-14.5]	291	64.0%	[0.3-5.0]	60	13.2%	[6.0-12.6]

Note. n = 455. Extreme growth: height increase > 3 in. and/or weight increase > 5 lbs in 6 months

Changes in BMI-for-age weight status were also examined for each child. Of note, 23 children (5%) changed at least two weight categories. For example, seven children went from a normal weight status in August to an obese weight status in February and three children went from underweight in August to overweight or obese in February.

Focus Group Data

A total of ten members of the HS health (all female) team took part in the focus group. Results of the focus group yielded three themes: Pressures on HS teachers; HS teacher lack of understanding of BMI; and lack of precision of the data collection. One sample quote is provided in the results with additional quotes provided in Table 3.

The health team described the pressures on teachers that may influence their ability to see the height and weight measurements as a priority. They described teacher time as a major challenge. Participant 2 stated "*Teachers come in and they feel pressed for time to get this done and I don't think they see that as really important."* The health managers also described that they perceived the teachers lack understanding of the measurements and how these measures are connected to their roles as teachers. Participant 4 described that *"Because their job is to educate these kids, they don't get into the health aspect. They don't feel like it's their job to do, so they do it to check it off."* The health team also described how these previous factors (e.g other time pressures and not seeing the connection of the measurements to their teaching role or academic outcomes) may influence the lack of precision of the data collection. They described their observations of the teachers' collection of height and weight measurements with Participant 3 stating that "*I had a teacher that lined them up, measured the first one and from there, "Oh you're about an inch taller, you're about this, you're about this. Okay, jump up on the scales, you're 38 pounds, oh you're about 39, you're about 38 and a half ".*

TABLE 3

Head Start Health Team Focus Group Themes and Additional Supportive Quotes

Theme	Supportive Quotes
Pressures on HS teachers	*Teachers got whammed with more testing this year on top of what they've been doing and they just feel like their time is sucked up* . (Participant10)
	Their time is just as valuable as ours and I think they felt overwhelmed. (Participant 5)
HS teacher understanding of BMI	*I think they don't find it as important as we do. They don't understand the importance as it relates to health. The teachers actually get those [BMI feedback letters with height, weight, and BMI percentile] and place those into the back packs. I don't know that they- they actually read it.* (Participant 6)
	The data [BMI measurement] doesn't guide them, "Oh, because I have this information, this is what I should do," really there's no connection between what they teach and the data. I think we should give them feedback like, "Here are the results from your class," so they have some shared information about it? That would be helpful. (Participant 5)
	They do it as requirement that they get it done, not that they are going to be able to do anything with it or get any kind of end result out of it. (Participant 10)
Precision of the data collection	*Sometimes they come into my office and use the equipment there instead of taking it to the classroom. The teacher brings the child in, he's got tennis shoes with soles like this, sets him on there and takes his height, I go, "You're not taking his shoes off? You just added 3/4 of an inch to his height."* (Participant 6)

DISCUSSION

Research has shown that implementing school-based BMI screening and intervention programs targeting early childhood can stabilize the obesity trajectory of children through elementary school (Moreno-Black, et al, 2016). Since federally funded HS programs are required to collect height weight/BMI measurements of preschoolers, they are in a position to provide relevant, local obesity screening data of low-income preschool aged children, which has the potential to be used as surveillance data, as well as evaluation data for obesity prevention/health promotion programs over time. The purpose of this study was to examine raw height and weight data of HS preschoolers and to explore HS health team perceptions of the data collection process.

An initial examination of the aggregate child BMI data revealed obesity rates in this group declined over the 6-month period, which would be a significant outcome for this program. However, after a review of the raw data, there were questions whether challenges in the measurement process

could have contributed to these declines. Nearly 25 percent of the children had a decrease in weight or had no weight gain over the 6-month time frame, which would be unlikely given children's growth patterns. Previous research has not been reported on child measurement challenges in HS programs specifically, however, challenges in obtaining accurate measurements in children in general have been reported and identified as predominantly related to child variations and persons obtaining the measurements (Himes, 2009).

Qualitative results, while limited, provide some insight into perceptions of possible challenges experienced in collecting height and weight measurements in HS preschoolers. In this program, teachers and classroom staff were responsible for collecting height and weight measurements, which may be similar in other HS programs with program sites across large geographic locations or those with limited staffing. However, barriers such as teachers' daily responsibilities, time pressures, and lack of understanding around the importance or relevance of the measurements may have contributed to reduced reliability and precision. Therefore, despite receiving standardized equipment and a brief training, a more in-depth training in conducting height and weight measurements, including calculating and interpreting BMI results, and understanding the impact of errors on the child's BMI status, may be warranted (Nihiser et al., 2007). The training could include demonstration and practice sessions, which was not utilized in this study, to exhibit understanding and proper technique, as well as examples illustrating how small errors in height and weight in preschool children can impact BMI percentile and associated weight status category. Providing additional information regarding the association between obesity and academic performance may assist in increasing teacher understanding of the measurements, as well as their role in the process. This is consistent with adult learning theory which states that adults learn best by understanding why something is important to know or do, and through experiential learning (Knowles, 2015). Additional continuing education or professional development opportunities for HS staff may also be created to teach best practices and enhance the foundational knowledge around height/weight/BMI measurement in children. Professional development for staff can also serve to highlight the role and importance of BMI in obesity prevention evaluation for HS programs and weight status surveillance over time.

This study has several strengths including, the number of child paired height and weight measurements and subsequent BMI categorization. The results of this study, however, are limited to the examination of one HS program height and weight measurement data and may not reflect the manner in which all Head Start programs collect anthropometric data of preschoolers. The National HS performance guidelines do not specify the personnel responsible for the collection of child measurements and, the individual(s) responsible for measurement collection may likely vary across programs, counties, and states (USDHHS, n.d.). Individuals may even change from measurement to measurement due to staffing changes. HS programs may also vary substantially with respect to whether they offer height and weight measurements for children, or rely on outside sources (i.e. Consultants, Physicians). However, according to the 2016 Health Manager report, approximately 80% of HS programs provide on-site height and weight measurements to enrolled students (Karoly et al, 2016). Future research could explore how BMI measurements are collected at various programs across states, who is responsible for overseeing and collecting the measurements, and the training provided in order to determine best practice recommendations. Another limitation includes the decision not to utilize BMIz-scores in the analysis. While this is often seen as common practice, recent research provides caution around utilizing z-scores in

severely obese children, particularly when using the BMI as an evaluation measure for program outcomes (Freedman et al., 2017), as might be done in HS programs.

There is limited research around the process and personnel responsible for height and weight measurements in HS programs. Previous research has used the BMI data collected by HS to evaluate policy and environmental interventions instituted at the local and state level as well as to evaluate change in BMI over time (Ansari et al, 2015; Lumeng et al, 2015). In each of these studies, anthropometric data was provided by HS with limited details provided around the process of anthropometric data collection. Our research provides insight into potential challenges of anthropometric measurement of preschoolers that can occur at the HS program level where this data is collected. However, more research is needed to explore whether other HS programs have similar experiences.

Implications for Practice

There is a need for on-going surveillance and monitoring of the prevalence of overweight and obesity among children, especially in high-risk populations similar to those served by HS preschools (Imoisili et al., 2020). Head Start Performance Standards outline the program's responsibility in supporting the nutritional health of enrolled preschoolers. However, general guidance is provided, giving latitude to each program to operationalize and tailor health policies at the local level to align with the program's capacity for implementation, which may result in variations in how height and weight data is collected and who is responsible for collecting this data. The impact on the accuracy of height and weight measurement that may occur as a result of these variations could be minimized by the use of best practices.

Provision of regular training and standardization of data collectors, as well as limiting the number of data collectors, are considered components of best practice measures for BMI screening and surveillance (Himes, 2009). Additionally, while advanced formal education is not required to take high-quality measurements, adequate and on-going training is necessary to ensure reliability of results. Local HS programs may benefit from assigning this task and training to specific personnel or partnering with external organizations who have this capacity to collaborate/assist with the data collection. Choosing appropriate measurement equipment (to include regular calibration) and establishing standardized measurement protocols have also been identified as best practices (Himes, 2009). Suggestions for a measurement protocol include having a written document with images of correct child positions and storing the document with the equipment, as to be available for each use. Guidance from national HS on the creation of local policies and protocols around BMI data collection may be beneficial, as HS is in a position to conduct BMI surveillance of low-income children enrolled in the program and evaluate obesity prevention efforts over time.

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