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Body mass index of children and youth with an intellectual disability by country economic status

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ABSTRACT

Objective: Individuals with intellectual disabilities are at higher risk for health disparities including overweight and obesity; however, little is known at the population level about the BMI status of children and youth with intellectual disabilities. This study is a secondary analysis of BMI status (underweight, normal weight, overweight and obese) in children and youth (8–<18 years) participating in Special Olympics by country economic status.

Methods: A total of 14,032 participants ($n = 8{,}856$ male) measured height and weight records were available from the Special Olympics International Health Promotion database. The 141 countries in the database were re-coded according to the World Bank's classification of country economic status. BMI prevalence rates were calculated for underweight, normal weight, overweight, and obesity for children and youth using IOTF cutoffs by economic status. Chi-squared analyses and Fisher's exact test were used to examine differences in weight status by economy and sex.

Findings: Overall, 27.87% of Special Olympics participants from low–income economies, 31.04% from lower middle-income, 25.29% from upper middle-income, and 42.36% from high-income economies had BMI levels outside of the normal range. The low–income countries had higher rates of underweight and the high-income countries had higher rates of obesity.

Conclusions: The high levels of both underweight and overweight/obesity found in this population of children and youth participating in Special Olympics represents a double burden of health risk. More research is needed to understand why this population experiences such disparities in BMI status and to develop health promotion initiatives targeted at this population.

Introduction

It is well established that obesity is one of the greatest global public health challenges of the 21st century for both adults and children (Han et al., 2010; Janssen et al., 2005; Wang and Lobstein, 2006; World Health Organization, 2006, 2009). The consequences of obesity are not disputed and can have long-term negative effects on several aspects of overall health including chronic conditions such as type-2 diabetes, hypertension and cancer (Han et al., 2010; Janssen et al., 2005; Lobstein et al., 2004; Pulgaron, 2013; World Health Organization, 2009). For some populations, obesity can also lead to mobility impairments, reduced function and loss of independence (Rimmer and Yamaki, 2006). Further, childhood obesity has been shown to track into adulthood (Singh et al., 2008).

The World Health Organization (2013) reports that over 40 million children under the age of 5 were overweight in 2011, and high obesity rates are no longer considered to be a problem reserved for developed countries (Gupta et al., 2013; Popkin et al., 2012; Wang and Lim, 2012; Wang and Lobstein, 2006). Data from children in developing countries are not as plentiful as in developed countries; however, over the past two decades, there is evidence of a nutrition transition (Popkin et al., 2012; Wang and Lim, 2012) and activity transition (Adamo et al., 2011) in many developing countries contributing to higher rates of obesity being found in these regions. In fact, many low- and middle-income countries are now experiencing a "double burden of disease" where both infectious and chronic disease are co-occurring at high rates (World Health Organization, 2013). Even though obesity rates have been rising globally, there is still considerable variability across the world (Wang and Lim, 2012; World Health Organization, 2013). It is also important to acknowledge that BMI status, as with overall health, can vary by economic status within a single country or region (CSDH, 2008; Popkin and Slining, 2013; Wang and Lim, 2012; World Health Organization, 2009). Although low and lower–middle-income

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countries have historically experienced elevated levels of underweight, the prevalence of underweight appears to be decreasing in some regions, while overweight and obesity are increasing (Popkin et al., 2012; Wang and Lim, 2012). As a result, some low and lower–middle-income countries are experiencing both elevated levels of underweight and overweight/obesity in the same population at the same time (Popkin and Slining, 2013). These patterns in BMI status are occurring in the general population; however, much less is known about the patterns in BMI status for sub-groups of the general population such as children and youth with intellectual disabilities (ID) from a global perspective (Lloyd et al., 2012).

The evidence related to BMI status of children and youth with ID is not as robust as the literature on the general population partly due to the fact that children and youth with ID are often under-reported, excluded or inaccurately identified in large-scale national and international health surveys (CDC/NCBDDD, 2009; Emerson and Hatton, 2014; World Health Organization, 2011). At the population level, even less is known about the BMI status of children and youth with ID because much of the research on BMI status of children and youth with ID has been derived from high-income countries and small sample sizes (De et al., 2008; Emerson and Robertson, 2010; Lloyd et al., 2012; Maïano, 2011; Rimmer et al., 2010). A paper by Lloyd et al. (2012) is the exception. They reported on the BMI status (excluding underweight) by six world regions as established by Special Olympics International (SOI). The evidence on overweight and obesity clearly indicates that children and youth with ID have higher rates of obesity than the general population (Foley et al., 2014; Lloyd et al., 2012; Rimmer et al., 2010), and adults with ID also experience very high rates of overweight and obesity (Foley et al., 2013; Hsieh et al., 2014; Temple et al., 2014). The paper by Lloyd et al. (2012) indicated that overweight and obesity rates were high in all regions of the world for children and youth with ID and were highest in North America; but these data were not stratified by country economic status and did not include underweight in the analysis. There is evidence that adults with ID have increased risk of being underweight (Bhaumik et al., 2008; Emerson, 2005; Temple et al., 2014), and growing evidence of the feeding difficulties and risk of underweight in children with ID (Marshall et al., 2003; Mouridsen et al., 2002; Sari and Bahceci, 2012), more research is needed to understand the patterns in BMI status in this population from a global perspective. The purpose of this paper is to use the Health Athletes Database from SOI to report on BMI status of child and youth Special Olympians by country world economic status.

Methods

Participants

This study is a secondary analysis of BMI status (underweight, normal weight, overweight and obese) in children and youth (8–<18 years) participating in Special Olympics by country economic status. Special Olympics is a global sporting organization with extensive international reach within this population; a person is eligible to participate in Special Olympics if he/she has an ID, and is at least 8 years of age (Special Olympics International, 2010). An individual is considered to have an ID for purposes of participating in Special Olympics if they meet any of the following requirements: (a) they have a cognitive delay as determined by standardized measures such as an intelligence quotient (IQ), (b) a service agency or professional has determined the person has an ID in accordance with local policies, or (c) the person has functional limitations in both general learning and adaptive skills (Special Olympics Inc., 2012).

Data source

For over 10 years, SOI has been conducting free Healthy Athletes screenings at local, national and international sporting events; these data are stored electronically with SOI (Lloyd et al., 2012; Temple et al., 2014). Data for this study were derived from the SOI Health Promotion database. Variables included sex, date of birth, age (calculated), event, location, delegation (world region and country), height and weight for analysis. BMI was calculated using the measured height and weight variables and classified using the child and youth cutoffs from the International Obesity Task Force (IOTF) for underweight (Cole et al., 2007), normal weight, overweight and obese (Cole et al., 2000). Underweight was based on grade 2 thinness cut points as defined by Cole et al. (2007). Participants' delegations were re-coded according to the World Bank's criterion for classifying economies (The World Bank, 2012). The 141 countries within the SOI data set were grouped by economy according to gross national income per capita (The World Bank, 2012) as low–income countries ($n = 16$), lower middle-income countries ($n = 30$), upper middle-income countries ($n = 40$) and high-income countries ($n = 55$). Unique participants from 6 years of Healthy Athletes screening events (2006–2011) were included in this analysis, and all regions are represented in each year of data collection.

All height and weight data were directly measured by trained professionals (e.g., physical therapist, nurse or teacher) at Healthy Athlete screenings. For height and weight measurements, shoes, jackets, hair accessories and other items that interfere with measurement are removed; and the scale and the stadiometer are placed on a flat and firm surface. Height is measured using a portable stadiometer to the nearest 0.1 cm and weight is measured using a digital weight scale to 0.1 kg (Lloyd et al., 2012; Special Olympics, 2007; Temple et al., 2014).

Before participation in Special Olympics events, athletes and/or their guardians sign a medical release/consent form to participate in their respective event(s). As part of this document, separate consent is given for the Healthy Athletes screening including consent for the de-identified data to be used to report on the health of Special Olympics athletes. Research ethics approval was granted by the three primary institutions of the authors to conduct a secondary data analysis of the SOI database.

Data cleaning

The data set from SOI had 16,061 participants between the ages of 8 and <18 years initially. Data cleaning procedures were as follows: (1) identification of multiple entries for one individual and delete duplicate or redundant entries ($n = 0$ deleted). Data were filtered by sex, birthday, country to identify duplicate entries; for individuals who had multiple entries in one year and/or entries over multiple years, the last entry for an individual was retained for analysis. (2) Listwise deletions were used when anthropometric, sex, country/region or age was missing ($n = 1719$ deleted). (3) Anthropometric values were flagged using the ZANTHRO macro for Stata. Flagged data were values outside the "biologically plausible": height between -5 z score and 5 z score, and weight between -5 z score and 5 z score (Lloyd et al., 2012).

Prevalence rates were calculated with confidence intervals for underweight, normal weight, overweight and obesity for SOI males and females by economic status (high-income, upper middle-income, lower middle-income and low-income) using the IOTF cutoffs for children and youth (Cole et al., 2000, 2007). Chi-squared analyses and Fisher's exact test (if 2×2 table had a value less than 10%) were used to examine differences in BMI status by economic status and sex. Average BMI z scores were also calculated by gender for each economic level (Vidmar et al., 2004). Data were analyzed using Strata/MP version 12 for windows (StataCorp LP, College Station, TX) and R version 2.12.2 (R Development Core Team, 2011).

Results

After data cleaning a total of 14,032 participants ($n = 8{,}856$ male) were included in the analysis. The average age of both the males and the females was 13.5 years. Table 1 presents the proportion of SOI participants in each BMI category (underweight, normal weight, overweight and obese) for each of the four income status groups (low-income, lower middle-income, upper middle-income and high-income) as well as the chi-squared and Fisher's exact tests comparing BMI status across groups. Fig. 1 shows the BMI z scores by world economic level for boys and girls and Fig. 2 compares the BMI status of male and female SOI participants in each economic status.

Discussion

The first objective of this study was to examine and compare the prevalence of underweight, normal weight, overweight and obesity in SOI participants 8–<18 years of age by country economic status.