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Commentary

A commentary on "Maternal work and children's diet, activity, and obesity"

Kathleen M. Ziol-Guest

New York University, Steinhardt School of Culture, Education, and Human Development, Department of Humanities and Social Sciences, 726 Broadway, 5th Floor, New York, NY 10005, USA

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In their recently published paper "Maternal Work and Children's Diet, Activity, and Obesity" Datar et al. (2014) make an important contribution to the existing literature on maternal employment and child obesity. A long-standing finding across disciplines is the positive association between maternal employment and children's body mass index (BMI), especially among more advantaged mothers. What is less studied, however, are the mechanisms that might explain this relationship. Datar et al. examine two important mechanisms, namely children's diets and level of activity both physical and leisure including television time. Despite using maternal reports of these variables, their findings that suggest consumption of unhealthy foods and more television viewing may mediate the relationship between maternal employment and obesity are quite convincing.

However, my critique of this study is not about what the authors did, but rather about what they did not do and did not address as limitations of their work. There are two primary pieces that this study does not speak to, but that future studies should. We must read this study's findings accordingly. First, taking a lifecourse or developmental timing perspective in this sample would provide evidence of the possibility that linkages between maternal employment and child BMI vary depending on when in the child's life that employment took place. These pathways linking maternal employment and child BMI may be particularly relevant during middle childhood. Eccles (1999) describes middle childhood as a period when children's self-esteem, competence, and individuality undergo rapid changes and development. During this time, children develop greater autonomy and also face higher expectations; however, their ability to think abstractly or apply their knowledge to new situations is quite limited. At this "pivotal age period", children's experiences can shape their future outcomes in profound ways, setting themselves on paths that can reverberate throughout their remaining childhood and into adulthood (p. 31). This is particularly relevant for the age of the children in Data et al.'s sample. Second, an important possible mechanism was excluded from the analyses, namely sleep. The omission of sleep in such analyses is problematic because it risks attributing to other factors (e.g., TV watching, physical activity, eating habits) what are really the effects of sleep. Indeed, children's fatigue may diminish their energy expenditure, increase their levels of sedentary activities such as TV watching, and upregulate their appetite (Knutson et al., 2007). In short, sleep may be the common mechanism underlying all of these lifestyle factors. Both how developmental timing and sleep would improve this analysis is discussed below.

1. Developmental timing

Numerous changes in children's health-related behaviors occur during middle childhood. For example, studies show that children's TV watching and other screen time increases during middle childhood (Saelens et al., 2002; Lindsay et al., 2006), and their consumption of healthy foods decreases during this time (Mannino et al., 2004). Despite findings suggesting that eating meals together is linked to healthier eating and improved child health (Hammons and Fiese, 2011), families are less likely to eat together as children age (Lindsay et al., 2006). Finally, children's sleep begins to decrease substantially in middle childhood (Snell et al., 2007); however, children at this age still need between 10 and 11 h of sleep per night (National Sleep Foundation, 2012). Thus, it is during middle childhood that many children begin patterns of behavior that are linked to their health outcomes. If maternal employment means that these changes occur in a context in which the child is not adequately supervised, or if maternal time pressures are particularly pronounced during middle

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E-mail address: kmz204@nyu.edu.

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childhood, then this developmental period may be a particularly sensitive one for the influence of maternal employment on children's BMI.

The transition into elementary school is also relevant for several of the mechanisms linking maternal employment and child BMI during middle childhood. Studies suggest that greater exposure to school meals is linked to less healthy eating (Schanzenbach, 2009). Additionally, as children enter elementary school, there are fewer natural opportunities for physical activity and active play. The U.S. Surgeon General and other child health organizations promote the goal of at least 150 min per week of physical education (PE) for elementary school children. Research shows that time in PE is associated with reduced BMI and obesity among elementary school children (Cawley et al., 2012). However, only 3.8% of schools meet this requirement (Lee et al., 2007). This means that the onus for promoting physical activity among school-aged children falls mainly on parents and needs to occur during out-of-school hours. This could be challenging if parents are working during the times that children are available for such activities, or if the available afterschool care options do not promote such activities.

Furthermore, there is evidence that children's health behaviors in middle childhood set the stage for later activities and outcomes (Eccles, 1999). For example, evidence suggests that children's BMI in earlier developmental periods is strongly correlated with their overweight and obesity at age 12 and that this is particularly true for BMI in middle childhood (Nader et al., 2006), suggesting that health-related behaviors during this period may be especially important. Similarly, some evidence suggests that eating patterns take hold during middle childhood, with those developing healthy habits maintaining them, and those with less healthy habits doing likewise (Mannino et al., 2004). Thus, there is reason to think that maternal employment in middle childhood in particular could be linked to BMI in adolescence.

As noted above, the pathways linking maternal employment and child obesity may be particularly relevant for school-aged children. School-age children with employed mothers may have more independence over their time use, food choices, and sleep routines, and less adult supervision than do younger children, but yet may not be able to make as informed choices as do adolescents; thus maternal employment at this stage of life could precipitate poorer food choices, more sedentary activity, and less sleep, the result of which is reflected in higher BMI.

2. Sleep as a mechanism

2.1. Sleep and children's BMI

I would also argue that the authors have missed an especially important third mechanism (and perhaps the only mechanism), sleep. Research into the dramatic increase in rates of obesity among children ages two to 19 over the last decades has indicated a linkage with shorter duration of sleep. Several recent reviews of cross-sectional and prospective studies have uniformly concluded that shorter sleep duration strongly associates with both current weight and future weight among children (Nielson et al., 2011; Chen et al., 2008; Knutson et al., 2007; Patel and Hu, 2008; Van Cauter and Knutson, 2008). The body of research represents numerous countries, suggesting that the observed relationship is not necessarily culturally situated. Several studies have found a dose–response relationship in hours of sleep to BMI (Chen et al., 2008; Sekine et al., 2002), and meta-analysis estimates have suggested children with shorter sleep duration (according to an individual study's criteria) have a 58% higher risk of being overweight, or 92% among those with the shortest amounts of sleep (Chen et al., 2008). In contrast, the evidence linking shorter sleep with weight among adults has been more mixed, highlighting the particular salience of the relationship specific to children. Moreover, children in early and middle childhood potentially exhibit the largest sensitivity to shorter sleep (Bell and Zimmerman, 2010; Chen et al., 2008; Snell et al., 2007). Impacts of short sleep on weight may accumulate early, as lesser sleep over the first two years has been associated with overweight status by age three (Taveras et al., 2008).

Long-term effects of early sleep patterns on later BMI have also been found (Agras et al., 2004; Reilly et al., 2005; Snell et al., 2007). One study found that childhood sleep predicted BMI and overweight/obese status at age 32 even after controlling for the precise reasons for why lesser quantities of sleep may lead to increased weight gain are unknown. Much work has suggested the sleep–BMI relationship stems from disrupted neuroendocrine and metabolic processes (Bass and Turek, 2005; Van Cauter and Knutson, 2008). With less sleep, the endocrine function produces reduced amounts of leptin, a hormone that inhibits hunger and food intake in high levels and stimulates it in low levels (Liu et al., 2008). By contrast, levels of ghrelin, a peptide produced in the stomach that stimulates the appetite, increase. One experiment randomly assigned a small group of healthy young men to either restricted or extended time in bed, and found that sleep restriction was associated with lower daytime leptin levels, higher ghrelin levels, and increased reported hunger and appetite (Spiegel et al., 2004). The same association was also replicated in a population based study (Taheri et al., 2004). Furthermore, sleep loss has been linked with decreased glucose tolerance, also considered a risk factor for obesity, resulting in compromised insulin sensitivity (Gangwisch et al., 2005).

A smaller number of studies have also attempted to understand the relationship of timing of sleep (bedtimes and waketimes) to weight. While some cross-sectional work has found no significant association between later bedtime and BMI among young children (Sekine et al., 2002), others have found a significant, positive relationship (Jiang et al., 2009) and longitudinal research has found a positive relationship for younger but not older children (Snell et al., 2007). Less total sleep in early childhood, driven by lower amounts of daytime sleep, has been linked with higher subsequent BMI (Agras et al., 2004), indicating the importance of daytime sleep in early development. Even fewer studies have examined the quality of sleep. Overweight adolescents have been found to exhibit higher rates of sleep problems compared to a normal weight group (Beebe et al., 2007). One study that monitored 335 children aged seven to 17 for three nights with polysomnography found that after adjusting for multiple confounders, one hour less sleep increased the risk of overweight by two. However, one hour less of Rapid Eye Movement (REM) sleep, the sleep stage with higher glucose utilization and metabolic rate, increased the risk of overweight by three (Liu et al., 2008). In comparison, a study of 383 children aged 11 to 16 that captured sleep disturbance through 24-h wrist actigraphy found no direct association of sleep disturbance with obesity (Gupta et al., 2002), although sleep disturbance was associated with lower physical activity. Another study that used parental reports of sleep problems in third and six grades found no association with overweight status (Lumeng et al., 2007).

2.2. Maternal employment and children's sleep

While children's sleep influences BMI and obesity, maternal employment likely affects children's sleep duration, quality, and timing. First, mothers who are employed have fewer hours at home compared to mothers who are not, and they may have less time to monitor and enforce children's sleep. Mothers working long hours have even fewer hours at home, and those working nonstandard or long shifts are often working when children are going to bed,