



ONLINE
EXCLUSIVE

Q/ Does inadequate sleep increase obesity risk in children?

EVIDENCE-BASED ANSWER

A / YES, A LINK HAS BEEN ESTABLISHED BUT NOT A CAUSE-EFFECT RELATIONSHIP. Shorter reported sleep duration in childhood is associated with an increased risk of overweight or obesity years later (strength of recommendation [SOR]: **B**, meta-analyses of prospective cohort trials

with high heterogeneity). In toddlers, accelerometer documentation of short sleep duration is associated with elevation of body mass index (BMI) at 1-year follow-up (SOR: **B**, prospective cohort). Adequate sleep is recommended to help prevent excessive weight gain in children (SOR: **C**, expert opinion).

Evidence summary

Multiple analyses suggest short sleep increases obesity risk

Three recent, large systematic reviews of prospective cohort studies with meta-analyses in infants, children, and adolescents all found associations between short sleep at intake and later excessive weight.

The largest meta-analysis included 42 prospective studies with 75,499 patients ranging in age from infancy to adolescence and with follow-up ranging from 1 to 27 years. In a pooled analysis, short sleep—variously defined across trials and mostly assessed by parental report—was associated with an increased risk of obesity or overweight (relative risk [RR] = 1.58; 95% CI, 1.35-1.85; $I^2 = 92\%$), compared to normal and long sleep. When the authors adjusted for suspected publication bias using a “trim and fill” method, short sleep remained associated with later overweight or obesity (RR = 1.42; 95% CI, 1.12-1.81). Short sleep was associated with later unhealthy weight status in all age groups: 0 to < 3 years (RR = 1.4; 95% CI, 1.19-1.65); 3 to < 9 years (RR = 1.57; 95% CI, 1.4-1.76); 9 to < 12 years (RR = 2.23; 95% CI, 2.18-2.27); and 12 to 18 years (RR = 1.3; 95% CI, 1.11-1.53). In addition to high heterogeneity, limitations of the review included variability in the definition of short sleep, use of parent-

or self-reported sleep duration, and variability in classification of overweight and obesity in primary studies.¹

A second systematic review and meta-analysis included 25 longitudinal studies (20 of which overlapped with the previously discussed meta-analysis) of children and adolescents (N = 56,584). Patients ranged in age from infancy to 16 years, and follow-up ranged from 6 months to 10 years (mean, 3.4 years). Children and adolescents with the shortest sleep duration were more likely to be overweight or obese at follow-up (pooled odds ratio [OR] = 1.76; 95% CI, 1.39-2.23; $I^2 = 70.5\%$) than those with the longest sleep duration. Due to the overlap in studies, the limitations of this analysis were similar to those already mentioned. Lack of a linear association between sleep duration and weight was cited as evidence of possible publication bias; the authors did not attempt to correct for it.²

The third systematic review and meta-analysis included 22 longitudinal studies (18 overlapped with first meta-analysis and 17 with the second) of children and adolescents (N = 24,821) ages 6 months to 18 years. Follow-up ranged from 1 to 27 years. This meta-analysis standardized the categories of sleep duration using recommendations from the Sleep Health Foundation. Patients with short sleep duration had an increased

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➤ **Three large systematic reviews all found associations between short sleep at intake and later excessive weight.**

risk of overweight or obesity compared with patients sleeping “normal” or “longer than normal” durations (pooled OR = 2.15; 95% CI, 1.64-2.81; $P = 67\%$). The authors indicated that their analysis could have been more robust if information about daytime sleep (ie, napping) had been available, but it was not collected in many of the included studies.³

Accelerometer data quantify the sleep/obesity association

A subsequent cohort study (N = 202) sought to better examine the association between sleep characteristics and adiposity by measuring sleep duration using accelerometers. Toddlers (ages 12 to 26 months) without previous medical history were recruited from early childhood education centers. Patients wore accelerometers for 7 consecutive days and then returned to the clinic after 12 months for collection of biometric information. Researchers measured body morphology with the BMI z-score (ie, the number of standard deviations from the mean). Every additional hour of total sleep time was associated with a 0.12-unit lower BMI z-score (95% CI, -0.23 to -0.01) at 1 year. However, every hour increase in nap duration was associated with a 0.41-unit higher BMI z-score (95% CI, 0.14-0.68).⁴

Recommendations from others

In 2016, the American Academy of Sleep Medicine (AASM) recommended the following sleep durations (per 24 hours): infants ages 4 to 12 months, 12-16 hours; children 1 to 2 years, 11-14 hours; children 3 to 5 years, 10-13 hours; children 6 to 12 years, 9-12 hours; and teenagers 13 to 18 years, 8-10 hours. The

AASM further stated that sleeping the recommended number of hours was associated with better health outcomes, and that sleeping too few hours increased the risk of various health conditions, including obesity.⁵ In 2015, the American Academy of Pediatrics Committee on Nutrition acknowledged the association between obesity and short sleep duration and recommended that health care professionals counsel parents about age-appropriate sleep guidelines.⁶

Editor’s takeaway

Studies demonstrate that short sleep duration in pediatric patients is associated with later weight gain. However, associations do not prove a causal link, and other factors may contribute to both weight gain and poor sleep.

JFP

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