Systematic review demonstrating that breakfast consumption influences body weight outcomes in children and adolescents in Europe
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CRD summary
This systematic review of observational studies found that breakfast consumption was associated with a reduced risk of obesity and a reduction in body mass index in children and adolescents in Europe. The results should be interpreted with caution because of poor reporting of the review process and a lack of information on the quality of the included studies.

Authors' objectives
To review the evidence on the effects of breakfast consumption on body weight outcomes in children and adolescents in Europe.

Searching
Cochrane Central Register of Controlled Trials (CENTRAL), MEDLINE and EMBASE were searched in January 2009 for relevant studies. There were no language restrictions. Search terms were reported. Reference lists from identified studies and key reviews were scanned for additional articles.

Study selection
Studies conducted in Europe that investigated breakfast consumption of children or adolescents (under 18 years) and reported on at least one outcome of body weight, body weight changes and body mass index (BMI) were eligible for inclusion.

The included studies were cross-sectional or cohort studies conducted in Croatia, Czech republic, Denmark, Finland, Greece, the Netherlands, Norway, Portugal, Spain, Sweden and UK. Children and adolescents ranged in age from between seven and 21 years. Breakfast was defined in only a few studies. Several definitions of breakfast skipping were used (included breakfast frequency) to define the number of days in which breakfast was eaten. Definitions of being overweight and/or obese varied across studies.

The authors did not state how many reviewers performed study selection.

Assessment of study quality
The authors did not state that they assessed methodological quality.

Data extraction
Data were extracted on the outcomes using a standardised data extraction form. Where possible, mean differences and 95% confidence intervals (CI) were calculated to provide estimates of effect.

The authors did not state how many reviewers performed the data extraction.

Methods of synthesis
Pooled mean differences and 95% CIs were calculated using a fixed-effect model. \( \chi^2 \) and \( I^2 \) were used in the meta-analysis to examine statistical heterogeneity. Other results were summarised narratively where heterogeneity (not defined by the authors) was present.

Results of the review
Sixteen studies (n=59,528) were included in the review.

In a meta-analysis of three studies, there was a statistically significant association observed between breakfast skipping and high BMI (WMD 0.78 kg/m\(^2\), 95% CI 0.51 to 1.04; n=2,086). Moderate heterogeneity was observed across the
The effect of breakfast skipping on overweight and obesity outcomes was evaluated in 13 studies. Twelve studies found that skipping breakfast was significantly linked to children and adolescents being overweight or obese. One study reported that consumption of breakfast three to five days per week was associated with a higher chance of being overweight, but this was not significant for children who ate breakfast fewer than two times per week.

**Authors' conclusions**
This systematic review of observational studies found that breakfast consumption was associated with a reduced risk of obesity and a reduction in BMI in children and adolescents in Europe.

**CRD commentary**
The review addressed a question that was broad in scope. Criteria for the inclusion of studies were stipulated. Appropriate electronic databases were searched without language restrictions. There were no attempts to identify unpublished studies, so there was a risk of publication bias. Review methods were not reported, so any steps taken to reduce reviewer error or bias during the review process were unknown. There was no assessment of methodological quality, so the results from these studies and any synthesis may not be reliable.

The authors' decision to statistically combine the results of the studies in a meta-analysis may not have been appropriate (results from cohort and cross-sectional studies are vulnerable to a large number of biases and confounding factors, and pooling may provide an overestimation of effect). The authors correctly acknowledged the limitations of the review in terms of risk of publication bias, inclusion of observational studies and non-standard definitions of breakfast and breakfast skipping used in the review.

The results should be interpreted with a substantial degree of caution because of poor reporting of the review process and a lack of information on the quality of the included studies.

**Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that in future research, definitions should be provided for breakfast and breakfast skipping. Confounders such as parental obesity, birth weight, dietary factors, physical activity, socioeconomic status, age and sex should be controlled.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.