

**Citation:**

Dunton GF, Kaplan J, Wolch J, Jerrett M, Reynolds KD. Physical environmental correlates of childhood obesity: a systematic review. *Obes Rev.* 2009;10(4):393-402.

**PubMed ID:** [19389058](#)

**Study Design:**

Systematic review

**Class:**

M - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

- Systematic review of quantitative research examining built and biophysical environmental influences on overweight and obesity in children and adolescents.
- There was specific focus on those environmental variables thought to impact obesity-related outcomes through physical activity.

**Inclusion Criteria:**

- Measure one or more features of built or biophysical environments.
- Measure BMI, overweight or obesity.
- Be quantitative and analytic in approach.
- Report separate results for youth (aged 0-18 years).
- Be written in English.
- Be published in a peer-reviewed journal before 31 May 2008.

**Exclusion Criteria:**

- Studies were excluded if they:
- Only examined features of the home and/or school environments.
- Assessed built environmental characteristics thought to influence obesity through food consumption (e.g. fast food restaurants, food stores).
- Measured social environmental variables (e.g. crime, safety, neighborhood socioeconomic status, neighborhood stress, neighborhood demoralization, collective efficacy, social capital and population size or density).

**Description of Study Protocol:****Recruitment**

- Literature searches using PubMed, PsychInfo and Geobase.
- Searches consisted of at least one of the following environment terms: physical environment, built environment, perceived environment, natural environment, population density, land use, street connectivity, neighborhoods, urban design, urban sprawl, urban form, air quality, pollution, trails, traffic, altitude, vegetation or weather, and one of the following obesity-related terms: obesity, overweight, body fat, body composition, BMI, body weight, body shape, waist circumference, skinfold or waist to hip ratio.

## **Design**

- The initial research strategy was to perform a meta-analysis. However, after inspection of the studies, it became clear that such an analysis was not possible given the large number of environmental variables studied, inconsistency in measurement approaches and methodology, and heterogeneity in samples.
- Therefore, a systematic review was conducted using the semi-quantitative procedure offered by Sallis and colleagues.

## **Blinding used N/A**

## **Intervention**

- None
- Categorized by various built and biophysical environmental variables.
- A modified version of Lynch's lexicon of urban form elements as applied to the shaping of human activity patterns was used to classify potential physical environmental correlates of obesity in children and adolescents.
- Environmental variables were divided according to their level of scale (i.e. micro-urban[neighborhood or community], meso-urban [sub-area of a city] or macro-urban [whole city or region]) based on Lynch's conceptual framework.
- Variables falling into the microunban category were further classified according to Lynch's urban form elements (i.e. districts, paths, nodes, edges, landmarks).

## **Statistical Analysis**

- The key findings pertaining to the relationship between the physical environment and the obesity outcome were coded and reported separately for children (aged 0-12 years) and adolescents (aged 13-18 years).
- The direction of associations was indicated.
- When stratified results were provided, a separate coding and reporting was done for each analysis.
- Because of the small number of studies for each type of environmental variable, final association coding (i.e. summarizing across all studies) was not appropriate.

## **Data Collection Summary:**

### **Timing of Measurements**

- Studies published before May 31 2008.
- Eighty percent of the articles were published after January 1 2006.

### **Dependent Variables**

- childhood obesity

## **Independent Variables**

- built and biophysical environmental variables

## **Control Variables**

- The individual studies took into consideration other variables that were potential covariates, mediators and moderators.
- It was unclear if control variables were used in the overall systematic analysis.

## **Description of Actual Data Sample:**

**Initial N:** not given

### **Attrition (final N):**

- Fifteen studies met the inclusion criteria.
- Sixty per cent of the articles included a sample of more than 1000 participants.

### **Age:**

- Seven studies reported results for children (aged 3-12)
- Seven studies focused on adolescents (aged 13-18)
- One study included children and adolescents (aged 3-18)

**Ethnicity:** N/A

### **Other relevant demographics:**

- Some studies looked at boys and girls combined; some looked at girls only; some looked at boys and girls separately.
- Varied among the individual studies and is given in Table 1 of the article. Some studies were nationally representative samples.

**Anthropometrics** N/A

**Location:** US

## **Summary of Results:**

### **Key Findings:**

- Eighty-six percent of the studies were cross-sectional only, one included cross-sectional and longitudinal samples, and one was quasi-experimental.
- Environmental variables were measured objectively (e.g. through Geographic Information Systems, environmental audit) in 60% of the studies and subjectively in the remaining six studies (50% of these were based on child report).
- Seventy-three percent of the studies included in this review used an objective measure of obesity whereas the remaining studies relied on self-report of height and weight.
- Associations between micro-urban characteristics and BMI and/or obesity in children differed across demographic groups and geographical factors.

- Vegetation and the presence of hazards (e.g. litter, trash, noise) were correlated with obesity in children.
- Vegetation density assessed through satellite imagery was negatively associated with BMI in high- but not low-population-density areas.
- Among children classified as coming from low-socioeconomic-status families, reporting a greater number of neighborhood hazards was associated with having a lower BMI.
- Intersection density was negatively related to obesity for girls, and parent-reported road safety was negatively related to obesity in older children (10-12 years of age).
- The number of locked schoolyards was positively related to obesity in children.
- Obesity was negatively related to child-reported but not parent-reported access to physical activity facilities and availability of bicycle and walking trails.
- Meso-urban characteristics, such as housing density and land use mix, were unrelated to BMI.
- In adolescents, greater equipment accessibility and the number of physical activity and recreational facilities nearby were associated with lower rates of obesity.
- In contrast, the number of and/or distance to schools, private recreational facilities, parks and the presence of parks or gyms were not correlated with BMI.
- Adolescents living in rural, exurban and mixed urban were more likely to be overweight than individuals living in newer suburban, older suburban and inner city areas.
- When examined cross-sectionally, county-level sprawl was positively related to obesity outcomes. This relationship did not persist when tested through a longitudinal design.

#### Author Conclusion:

- Overall, few consistent findings emerged.
- For children, associations between physical environmental variables and obesity differed by gender, age, socioeconomic status, population density and whether reports were made by the parent of child.
- Access to equipment and facilities, neighborhood pattern (e.g. rural, exurban, suburban) and urban sprawl were associated with obesity outcomes in adolescents.
- For most environmental variables considered, strong empirical evidence is not yet available.
- Conceptual gaps, methodological limitations and future research directions were discussed.

#### Reviewer Comments:

- *I am not as familiar with the statistics for this type of study, but the descriptions of the statistical analyses used seems to be lacking. It appears that an actual analysis may not have been performed, but rather they used the reported associations in the individual studies.*
- *The paper does talk about coding, but this reviewer feels this section is unclear when it comes to the statistical portion of the study.*

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#### Research Design and Implementation Criteria Checklist: Review Articles

##### Relevance Questions

1. Will the answer if true, have a direct bearing on the health of patients?

Yes

2.	Is the outcome or topic something that patients/clients/population groups would care about?	Yes
3.	Is the problem addressed in the review one that is relevant to nutrition or dietetics practice?	Yes
4.	Will the information, if true, require a change in practice?	Yes

### Validity Questions

1.	Was the question for the review clearly focused and appropriate?	Yes
2.	Was the search strategy used to locate relevant studies comprehensive? Were the databases searched and the search terms used described?	Yes
3.	Were explicit methods used to select studies to include in the review? Were inclusion/exclusion criteria specified and appropriate? Were selection methods unbiased?	Yes
4.	Was there an appraisal of the quality and validity of studies included in the review? Were appraisal methods specified, appropriate, and reproducible?	Yes
5.	Were specific treatments/interventions/exposures described? Were treatments similar enough to be combined?	Yes
6.	Was the outcome of interest clearly indicated? Were other potential harms and benefits considered?	Yes
7.	Were processes for data abstraction, synthesis, and analysis described? Were they applied consistently across studies and groups? Was there appropriate use of qualitative and/or quantitative synthesis? Was variation in findings among studies analyzed? Were heterogeneity issues considered? If data from studies were aggregated for meta-analysis, was the procedure described?	Yes
8.	Are the results clearly presented in narrative and/or quantitative terms? If summary statistics are used, are levels of significance and/or confidence intervals included?	Yes
9.	Are conclusions supported by results with biases and limitations taken into consideration? Are limitations of the review identified and discussed?	Yes
10.	Was bias due to the review's funding or sponsorship unlikely?	Yes

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