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# **Evidence Brief:** Impacts of and relationship between excessive dietary sodium consumption and childhood obesity

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## Issue and Research Question

High dietary intake including sodium, calories, and fats is important in the etiology of chronic disease, including obesity and high blood pressure.[1] In 2011, the Ontario Government committed to decreasing childhood obesity by 20% over five years.[2] The 2007 Statistics Canada Health Report , citing 2004 data, indicated that a high percentage of Canadian children consumed sodium daily at levels exceeding the tolerable upper intake level (UL) recommended by the Institute of Medicine (IOM) and Health Canada.[3] Specifically, 77.1% of one to three year olds exceeded 1500 mg 92.7% of four to eight year olds exceeded 1900 mg, 90.0% of nine to 13 year olds exceeded 2200 mg and 89.5% of 14-18 year olds exceeded 2300 mg, which are the tolerable upper intake levels for each age group.[3] Given that integrated food and nutrition strategies typically address calories and multiple food nutrients at the same time, the relationship between excess dietary sodium intake in children and childhood obesity is of interest to public health.

This Evidence Brief asks two questions:

1) What are the long-term and short-term impacts of excessive dietary sodium consumption in children?

2) What is the relationship (if any) between excessive dietary sodium consumption and childhood obesity?

*Evidence Briefs* are a series of evidence summaries on key public health topics informed by rapid knowledge synthesis methods. Visit our website for more from this series.

## Methods

A web search of both published literature from electronic databases and grey literature sources was conducted on November 4th 2013, with additional references provided by key contacts. The search included two databases (Embase and MEDLINE) to locate published literature. A keyword search of Google Scholar was used to locate information on the web using combinations of the following search terms: 'sodium', 'sodium chloride dietary', 'salt', 'risk', 'child', 'youth / adolescent' 'obesity' 'overweight' and 'preschool'. Reference lists of key sources were searched for additional relevant content. Non-English articles and those published before the year 2000 were excluded. In the interest of time, articles retrieved were assessed for eligibility by one PHO staff member. Full text versions of all potentially relevant articles were retrieved. After reviewing the full text versions, a total of eight articles were included in the review. Relevant information was extracted from each article by one PHO staff reviewer. The full search strategy can be obtained from PHO.

## Main Findings

***Sodium intake and blood pressure***

Of the eight included papers, there were two meta-analyses and a large National Health and Nutrition Examination (NHANES) Survey (single study) that provided evidence that excess daily sodium consumption was positively associated with elevated systolic blood pressure.[4-6] Excess sodium was also positively associated with risk for pre-high blood pressure and high blood pressure among US children and adolescents (eight to 18 years old).[4] Pre-high blood pressure is a term used in the literature, which refers to blood pressure that is higher than normal but has not yet reached the level to be considered high blood pressure. Individuals with pre-high blood pressure have a greater than average chance of developing high blood pressure if no action is taken to prevent it.[7]

It has been suggested that high sodium content may suppress salt taste receptors in children, programming them to consume high sodium foods later in life.[6] Research suggests children develop a preference for salt at age two to three years, and this preference may be associated with the development of hypertension as adults.[8]

***Sodium intake and obesity***

Of the eight included studies, two large cross-sectional studies of nationally-representative cohorts in the United Kingdom and Australia demonstrated relationships between excess dietary sodium consumption and increased consumption of sugar-sweetened beverages in children.[9,10] It was hypothesized that activation of the homeostatic trigger of thirst in response to dietary salt ingestion was associated with intake of sugar-sweetened beverages and subsequently, increased risk of obesity.[9]

Of the eight included articles, six articles reported on health outcomes, but did not evaluate their linkages to obesity. Although no review-level evidence on the link between sodium and obesity was identified, two cross-sectional studies demonstrated a correlation between dietary sodium consumption and childhood obesity.[11,12] These associations were significant after adjusting for total energy intake and consumption of sugar-sweetened beverages. A mechanism for this direct correlation has not yet been identified.

## Discussion and Conclusions

There is some evidence from cross-sectional studies that dietary sodium consumption exceeding the tolerable upper intake levels recommended by the Institute of Medicine and Health Canada is linked to childhood obesity through a direct unidentified mechanism. There is also evidence of an association between excess dietary sodium intake and increased intake of sugar-sweetened beverages. While the literature reviewed provided evidence on the relationship between excess dietary sodium consumption and outcomes such as high blood

pressure, childhood obesity as an outcome has received much less attention. It will be necessary to consider new studies as they emerge in the literature, and to complete syntheses in order to establish overall impact.

## Specifications and Limitations

This Evidence Brief presents key findings from the scientific literature. Its purpose is to investigate a research question in a timely manner to help inform decision-making. This report is not a comprehensive review of the literature, but rather a rapid assessment of the best available research evidence. There may be relevant pieces of evidence that are not included and these may alter the conclusions drawn from the document.

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