

# CHANGES SINCE 1980 IN BODY MASS INDEX AND THE PREVALENCE OF OVERWEIGHT AMONG INSCHOOLING CHILDREN IN NUUK, GREENLAND

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## ABSTRACT

**Objective.** The aim of the study was to examine the trends which have occurred during the past generation in body mass index (BMI) and in the prevalence of overweight and obesity among children in public schools in Nuuk, Greenland.

**Study Design.** The study is a retrospective cohort study of BMI among inschooling children (age 6 or 7 years old). A database was created on the basis of files from school-nurses containing information on height and weight among children having attended school in Nuuk since 1970. The database contained 10,121 measurements in total, whereas 2,801 were on inschooling children. Measurements from these children form the basis of this study. Mean and quartiles of BMI among the inschooling children in 5-year intervals were used to determine the development in BMI since 1980. On the basis of international cut-points (1) for use among children and adolescents, the proportion of overweight and obese children and the trends since 1980 were determined.

**Results.** The mean BMI has risen by a total of a bit more than 6% since 1980, corresponding to a rise of 1.2-3.8% for every 5-year period. Increases are also observed when assessing the proportion of overweight and obese, which were 6.6% and 0.9%, respectively, among the inschooling children during the period 1980-1984. These proportions increased to 16.5% and 5.2%, respectively, in 2000-2004.

**Conclusion.** This study has provided evidence that during the past two decades, children in Nuuk have undergone a development towards a higher prevalence of overweight and obesity.

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**Keywords:** overweight, obesity, body mass index, school children, Nuuk

## INTRODUCTION

Obesity is considered to be the largest threat to the health of the public (2), and the ongoing childhood obesity epidemic has been claimed to represent a major public health concern (3). It is a complex, multifactorial disease that develops from the interaction of genetic, metabolic, social, behavioural and cultural factors (4).

As the obesity epidemic spreads, general concerns about the significant health and economic consequences have also grown. Obesity has been linked to a variety of chronic diseases, a large number of deaths among adults, and major expenses in direct and indirect annual costs (5). The prevention and treatment of excess weight is critical for the health of both individuals and society. It is essential to monitor the development within a population in order to assess how widespread the problem is (1), and for health-care providers to be able to acknowledge the need for counselling on diet and physical activity (5). Monitoring is also needed to assess the need of health-promoting activities, as well as to predict the need of treatment of obesity-related disorders, such as diabetes, cardiovascular diseases, stress in motor apparatus etc. Some studies suggest that the prevention of obesity should be carried out early in life, which emphasizes the importance of monitoring children and adolescents, as well as adults (6, 7). The most optimal study design is to register anthropometric measures similarly over time and, thereby, identify the proportion of overweight and obese individuals in a population.

The purpose of this study was to determine the development in body mass index (BMI) among school children in Nuuk, Greenland.

## METHODS

The study is based on data from 3,593 children having attended school in Nuuk during the years 1970 to 2004. The material is a cohort study of children aged 5 to 7 (inschooling children) and the prevalence of obesity is assessed by internationally recommended cut-off points proposed by Tim Cole and colleagues (1).

### Body Mass Index (BMI)

BMI is a widely used measurement of the relative body composition of an individual derived from measures of height and weight (weight (kg)/height (m<sup>2</sup>)). The adult cut-off points most widely used to assess overweight and obesity are, respectively, 25 and 30 kg/m<sup>2</sup>. Cole et al. (1) has proposed cut-off points for children and adolescents linked to those adults cut-off points of overweight and obesity (1), which have been used in the present study.

All children attending school are invited to see the school nurse annually to be measured and weighed (as well as to have hearing and vision abilities examined). Height is measured without shoes and weight in light clothes. All collected information is kept in paper files at Queen Ingrid's Hospital and at the School Nurses Office in Nuuk. The information on height and weight was computerized into SPSS version 12.0 for the purpose of this study.

### Age

BMI in childhood changes substantially with age and also differs between boys and girls, which is why Cole et al. (1) has presented for boys and girls and in age intervals of 0.5 years. The prevalence described in this study is a total for boys and girls, and the age noted

by the school nurses in Nuuk is rounded up to 0.5 years (5.75-6.24 = 6 years, 6.25-6.74 = 6.5 years, 6.75-7.24 = 7 years...) for appropriate use with regards to the cut-off points.

In this study, the inschooling children are selected and their BMI is used to describe the prevalence of obesity and the development over time, in groups of five-year intervals.

The database consisted of a total of 2.801 measurements on inschooling children (table I). The mean age is presented so as to allow the comparison of the age distributions in the groups, which did not differ significantly between the chosen periods of observation.

The population in Nuuk is both Inuit and Caucasian, and changes in the ethnic constitution of the population, could influence the prevalence of obesity. This matter will be discussed later in the paper.

## RESULTS

Among the inschooling children in 1980-1984, 6.6% were classified as overweight and 0.9% as obese. These proportions rose to 8.8% and 2.2%, respectively, in 1985-1989 and continued to increase, respectively, to 13.1% and

**Table I.** Mean age and number of measurements.

Time period	Mean age	No. of BMI measurements
1980-1984	6.76	454
1985-1989	6.66	452
1990-1994	6.52	363
1995-1999	6.46	776
2000-2004	6.58	756

**Table II.** Development of BMI (kg/m<sup>2</sup>), mean and quartiles.

Time period	Mean	Percentile		
		25%	50%	75%
1980-1984	15.72	14.83	15.58	16.39
1985-1989	15.92	14.86	15.79	16.72
1990-1994	16.32	15.12	16.01	17.10
1995-1999	16.60	15.44	16.40	17.44
2000-2004	16.71	15.39	16.35	17.54

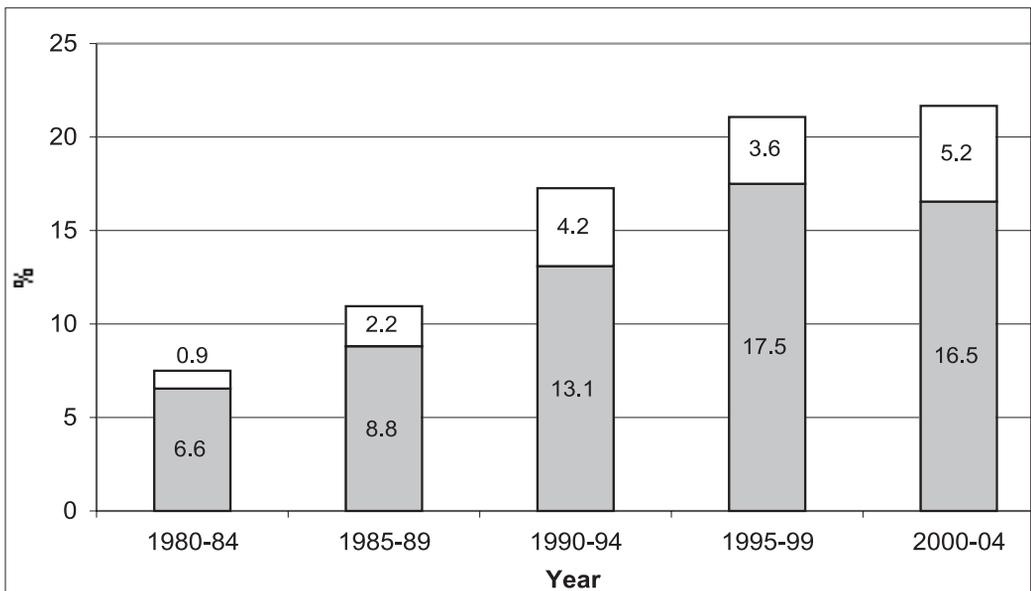


Figure I. The prevalence of overweight and obesity among school children in Nuuk. ■= Overweight and □= Obese.

4.2% obese in 1990-1994, and 17.5% and 3.6% in 1995-1999. 16.6% of the inschooling children were classified overweight and 4.7% as obese in 2000-2004 (figure 1). The population increase in BMI is also reflected by the mean and quartiles, as shown in table 2, which rose by a total of 6% from the period of 1980 to 2004. Some differences between the quartiles are observed, since, between 1980 and 2004, the lowest percentile rose by 4% and the highest percentile increased by 7% (table II).

## DISCUSSION

The study finds that the prevalence of obesity has increased among inschooling children in Nuuk, since the mean BMI has risen by 6% between 1980 and 2004. The rise in BMI was sharpest in the highest quartile. The proportion of children who can be classified as overweight and obese has risen from a total of 7.5% in 1980-1984, to 21.7% in 2000-2004.

Data has been collected on inschooling children in Copenhagen, born between 1930 and 1975, using the same method described in the present study. During this period, there was an increase in the prevalence of overweight until 1960, followed by a plateau until 1970, and a sharp increase thereafter. Since 1947, there has been an 8-fold increase in the prevalence of overweight among inschooling girls and an 11-fold increase among boys (8, 9).

It is estimated that an average of 20% (10-36%) of all 10-year-olds in Europe are overweight (10). It is also estimated that approximately one-third of all cases of obesity are due to genetic factors, but, since the human

gene has not changed during the past 20 years, this cannot explain the increase. Changes in lifestyle, represented by changes in diet and lower levels of physical activity, are presumed to be the major contributors to the increase (10).

When linking international differences to prevalences of obesity, it would be preferable to determine some of the lifestyle factors which contribute to the global epidemic of obesity, which could allow for better planning of preventive efforts. High priority should be given to monitoring the development in all parts of the world and among all age groups, and data should preferably be collected by the same method, in order to allow valid comparisons to be made.

The prevention of obesity among children should be given top political priority (2, 10). Once obesity is attained, it is difficult to treat with permanent results, which is why prevention of unhealthy weight gain should be an area of focus in public health planning.

School children have easy access to the purchase of sugary drinks and unhealthy snacks, and it has become a part of our culture that they do so. A political initiative could be to fund easier accessibility to more healthy foods in the schools (10) and provide fresh water tanks easily accessible as a healthy alternative to soft drink. 36% of the older school children in Greenland report eating sweets every day and a similar proportion drank soft drinks daily, while 21% report consuming both sweets and soft drinks (11).

There is a need for the continuous monitoring of the prevalence of overweight and obesity among children and adolescents, a

task which is perfectly feasible for school nurses, who are in regular contact with all school children. Since an individual's lifestyle is grounded in the early years, it should be of high priority to prevent overweight among children (10).

Important areas to increase focus are information to and corporation between school-nurses, teachers and the family in order to enhance a healthy diet and reduce inactivity among children.

The usefulness of BMI as an indicator of overweight among Inuit has been debated for several years, since the measure reflects the relative body composition of an individual. Using a retrospective approach, this study uses the BMI to reliably compare the development over time.

Regardless of the cut-off points used, the increase in BMI among children is clear and supports earlier studies indicating that the prevalence of obesity among Native American and Arctic Inuit is increasing (12). It could be argued that the proposed cut-off points lead to an overestimation of the proportions of overweight and obese in the population. This study cannot assess the usefulness of the proposed cut-off points, but it can, with certainty, verify an increase in the BMI of the young population of Nuuk during the past generation. This finding cannot be generalised to inschooling children in the rest of Greenland, but it is fair to presume that the conditions responsible for the rise in proportion of overweight children are also present in other parts of Greenland.

Ethnicity is an important aspect to consider in the interpretation of a study such as this.

The place of birth is the only estimate of ethnic origin offered by the official statistics, but is not a complete and valid description of ethnicity. In 1993, a survey estimated that 85% of the people living in Greenland are ethnic Greenlanders, while an additional 4% are of mixed Greenlandic/Danish origin (13). In Nuuk, the proportion of 6-year-olds born in Greenland was 79% in 1990, 88% in 2000, and 85% in 2004 (14), numbers which, by themselves, provide no answers in the matter. The role of ethnicity in this study must therefore be left open, but the authors would like to underline the fact that obesity is a multifactorial disease that is strongly influenced by social and cultural factors. This makes it relevant to document its evolution within a particular society, regardless of ethnicity.

Among adults, there are higher risks of type 2 diabetes among overweight and obese individuals; these risks can supposedly be extrapolated to children (15). The prevalence of diabetes in the Greenlandic population is high (16), and the increasing proportion of overweight individuals makes this combination an alarming public health concern deserving close attention.

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