Socioeconomic status and changes in body mass from 3 to 5 years

M De Spiegelaere, M Dramaix, P Hennart

Abstract
The influence of social status on the development of body mass was analysed in a retrospective cohort study of 675 Belgian children monitored between the ages of 3 and 5 years by the preventive medical services in Brussels. At age 3, no association between excess weight and social status was observed. Adiposity rebound before age 5 was inversely related to body mass at age 3 and was independent of social status. The social influences on obesity observed in adolescence cannot be explained by a higher frequency of early adiposity rebound in children of low socioeconomic status.

(Keywords: socioeconomic status; adiposity rebound; obesity)

In industrialised countries adult obesity is associated with lower social status. Social class variation of obesity is increasing. If we are to develop preventive strategies, we must determine at what stage of life these differences develop.

There is little published research on the relation between social status and obesity in preschool children and what there is generally concludes that there is no connection. The relation in adults seems to develop during adolescence. Longitudinal studies of body mass during the period of growth indicate that obesity observed clinically in adolescence begins much earlier and especially at the time of adiposity rebound.

Changes in relative fatness with age occur simultaneously with changes in fat cell size or fat cell number. During the first year of life, adiposity increases rapidly owing to the growth in the size of the adipocytes. In the following years, adipose tissue growth decreases and then remains stable for several years, while body height continues to increase. This development is reflected by a decrease in relative fatness. The onset of the second period of rapid growth in body fat is referred to as “adiposity rebound.”

The statistical tests used were the \( \chi^2 \), the \( \chi^2 \) for trend, and the Kruskal-Wallis test.

Results
The prevalence of overweight at 3 years of age was 4.6%; this was identical for the two sexes and did not differ according to socioeconomic status (table 1). Adiposity rebound occurred in 30.4% of the children before age 5. This proportion did not differ between the social groups: 30.1% in group 1, 29.9% in group 2, 30.2% in group 3, 32.7% in group 4, and 28.8 in group 5.
The proportion of children showing an early rebound (30.4%) was very close to that found by Rolland-Cachera (30.5%). The latter finding was based on data from almost 30 years ago, therefore, the proportion of early rebound has not changed with time.

This proportion is smaller with increasing body mass at age 3. This could be explained by the phenomenon of levelling: thin children tend to normalise their body mass with an early rebound, and fat children with a delayed rebound.11

The proportion of children with adiposity rebound before age 5 is independent of socioeconomic status even after controlling for body mass. The inequalities observed in adolescence do not appear to be linked to an excess of early rebound in children in the least favoured social groups.

While early adiposity rebound is no more frequent in children from a low socioeconomic group, rapid weight increase seems more common; however, the size of our sample does not permit conclusions on this topic. The hypothesis that social inequalities for obesity observed in adolescence can partly be explained by a more rapid increase in weight after an early adiposity rebound in children of low socioeconomic status should be studied further. If this is the case, preschool children should be screened for this problem and preventive strategies accessible to these groups should be developed to prevent too rapid weight increase in children who have an adiposity rebound before 5 years of age.

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Table 1 Prevalence of excess weight at 3 years of age by social group

<table>
<thead>
<tr>
<th>Social groups (n)</th>
<th>Excess weight, number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (146)</td>
<td>5 (3.5)</td>
</tr>
<tr>
<td>Group 2 (197)</td>
<td>11 (5.6)</td>
</tr>
<tr>
<td>Group 3 (139)</td>
<td>6 (4.3)</td>
</tr>
<tr>
<td>Group 4 (113)</td>
<td>6 (5.3)</td>
</tr>
<tr>
<td>Group 5 (80)</td>
<td>3 (3.8)</td>
</tr>
<tr>
<td>Total (675)</td>
<td>34 (4.6)</td>
</tr>
</tbody>
</table>

Group 1 is the highest social group, group 5 the lowest. No significant difference among social groups.

Table 2 Increase in body mass index between 3 and 5 years of age by social group in children with adiposity rebound before age 5

<table>
<thead>
<tr>
<th>Social group</th>
<th>n</th>
<th>Mean (SD)</th>
<th>Median (kg/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups 1 and 2</td>
<td>103</td>
<td>0.65 (0.66)</td>
<td>0.42</td>
</tr>
<tr>
<td>Group 3</td>
<td>42</td>
<td>0.77 (0.52)</td>
<td>0.71</td>
</tr>
<tr>
<td>Groups 4 and 5</td>
<td>60</td>
<td>0.92 (1.17)</td>
<td>0.54</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
<td>0.76 (0.82)</td>
<td>0.51</td>
</tr>
</tbody>
</table>

p > 0.05, χ², Kruskal-Wallis one way analysis of variance.

Adiposity rebound was significantly related to body mass at age 3: 41.9% of the children in the first body mass tertile (lean body mass) had an early rebound compared with 26% in the second tertile and 23.3% in the last tertile (p < 0.001).

After controlling for body mass at age 3, the relation between socioeconomic status and presence of an early rebound remained non-significant.

Among the children who had adiposity rebound before age 5, mean (SD) BMI increased by 0.76 (0.82) kg/m² between ages 3 and 5. In the lower socioeconomic groups a greater proportion of the children had an important increase in BMI between ages 3 and 5: 18.3% of children in the low socioeconomic group, 7.1% in the intermediate socioeconomic group, and 7.8% in the high socioeconomic group had an increase of > 1.6 kg/m² (above the 9th decile; p < 0.05, χ² for trend). On average, BMI increase was greater in the lower socioeconomic group, whereas the median was higher in the intermediate group (table 2).

At 5 years old, the prevalence of obesity was 8.4%: 6.7% in the more prosperous social groups, 12.2% in the intermediate groups, and 8.8% in the least favoured groups (NS).

Discussion

The prevalence of excess weight at 3 years of age in our sample is essentially similar to that observed when the reference curves were drawn up in 1961, which is not the case at age 5.10

At age 3 excess weight was not linked to socioeconomic status, in agreement with the results of other studies, which found no link between social status and obesity in young children.1,3
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