

## Short reports

# Obesity: trend in inequality

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Overweight and obesity prevalences increased during the 1980s and 1990s in the USA<sup>1</sup> and in Europe.<sup>2</sup> Belgium is no exception to this trend. Using a sub-sample of working men (aged 40-54), the Belgian Interuniversity Research on Nutrition and Health (BIRNH) study showed that prevalence of obesity rose from 9% in 1978 to 15% in 1993.<sup>2</sup>

Recent findings have shown that overweight and obesity differed in areas within a region or country,<sup>1,3</sup> but that trend in the geographical inequality has not been assessed up to now. In this paper, we examine whether such unequal distribution has changed between 1979 and 1990 among young Belgian men.

### Methods

We used data from the Belgian Armed Forces Medical Examination Service, undertaking an annual clinical check of 45 000 men. Analysis was restricted to subjects aged 18-25 residing in 544 (out of 589) Belgian municipalities with at least 200 men having undergone medical examination over the entire period. Complete data were available for 98.7% of these men. Although military service was compulsory in Belgium at that time, only 62% of the male population aged 18-25 had been submitted to the Armed Forces clinical examination. There were several reasons for being excluded from the examination: choosing to undertake a civilian service, belonging to a family counting two previously enrolled men or being the main financial support of the family. Health status may have influenced the probability of being enrolled but not that of being examined.

We computed prevalence of overweight (body mass index equal or above 25) and obesity (BMI  $\geq$  30) for each consecutive group of subjects enrolled over a two year period, from 1979 to 1990. Prevalence was directly standardised for age with the Belgian population of 1990 as standard. Standardisation was used to control for inter-municipalities variation in the age mix of the young men examined.

Geographical inequality of overweight and obesity prevalence was assessed by means of the Robin Hood Index.<sup>3</sup> The Robin Hood Index is the maximum difference between the cumulative proportion of the obesity and the cumulative proportion of the population. It can be also defined as the proportion of disease that would have to be redistributed from high prevalence areas to low prevalence areas to achieve equal distribution within the country.<sup>4</sup>

When ranking municipalities by increasing median income, the Robin Hood index measures socioeconomic inequality of obesity/overweight: the proportion of obesity/overweight that would have to be redistributed from poorer municipalities to better off areas to achieve equal distribution.

### Results

Between 1979 and 1999, overweight and obesity prevalences increased from 16% to 21% and from 2% to 4% (table 1). The annual increase of overweight and obesity was 0.4% and 0.2%, respectively. The inter-period correlation was high, tending to support the stability of municipal rates between periods (inter-period correlation for overweight is 0.72, 0.7, 0.7 for one, two and three period lags, respectively; for obesity prevalence, these coefficients were 0.56, 0.57, 0.55, respectively).

The Robin Hood Index indicated that, in 1990, about 9% of overweight and 19% of obesity would have to be redistributed from high prevalence areas to low prevalence ones to achieve an equal distribution among municipalities. This inequality pattern remained unchanged over the entire period. In 1990, the unequal socioeconomic distribution of obesity gave poorer municipalities 3% more overweight and 8% more obesity, compared with better off areas. Thus, socioeconomic inequality of obesity and overweight seems to be more variable but neither increases or decreases.

### Discussion

Overweight and obesity prevalences among young Belgian men present a slight geographical inequality showing no significant change throughout the 1980s. As obesity increased during the same period, this implies that the whole country shared this higher prevalence burden.

Highly educated men were less likely to undergo military service. During the 1980s, measures were taken by the Defence Secretary to enforce a more equal enrolment rate among different educational groups. To the extent that body mass index decreases with the socioeconomic status, lower proportion of enrolment of highly educated men might lead to a slight overestimate of overall prevalence. The enforcement of the rules may have changed the socioeconomic pattern of examined men during the period considered. However, the relation between the socioeconomic status and

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Table 1 Trend of overweight and obesity prevalences and inequality

	1979-80	81-82	83-84	85-86	87-88	89-90	Annual increase rate (95% CI) *
Overweight prevalence	0.163	0.165	0.168	0.185	0.190	0.208	0.4% (0.3%, 0.6%)
Obesity prevalence	0.022	0.024	0.025	0.026	0.033	0.038	0.2% (0.1%, 0.3%)
When ranking by decreasing prevalence							
Overweight Robin Hood Index	0.098 (0.0127)	0.097 (0.0127)	0.085 (0.0124)	0.101 (0.0123)	0.102 (0.0124)	0.085 (0.011)	0.002 (-0.17, 0.51)
Obesity Robin Hood Index	0.224 (0.0185)	0.205 (0.0175)	0.207 (0.0179)	0.224 (0.0175)	0.222 (0.0173)	0.190 (0.0168)	0.0007 (-0.03, 0.18)
When ranking municipalities by increasing income							
Overweight Robin Hood Index	0.024 (0.007)	0.026 (0.007)	0.030 (0.008)	0.032 (0.008)	0.022 (0.008)	0.031 (0.007)	0.000357 (-0.0011, 0.0018)
Obesity Robin Hood Index	0.065 (0.011)	0.060 (0.011)	0.047 (0.01)	0.062 (0.011)	0.050 (0.01)	0.076 (0.015)	0.000571 (-0.0033, 0.0044)
Number	97 156	100 015	97 190	91 158	86 849	87 230	

\*The rate and its standard error are computed by means of the  $\beta$  (and SD  $\beta$ ) of the following regression: overweight (or obesity) =  $\alpha + \beta$  year.

body mass index seems to be more relevant for women than for men.<sup>5</sup>

Lower health status might have decreased enrolment and increased body mass index, hence producing a downward bias of obesity prevalence. Nevertheless, as our database refers to examined population, whether enrolled or not, our results are less vulnerable to such a bias: obese young men may not have been enrolled, but after the clinical examination.

Examination and enrolment rate was higher in the north of the country and lower in the south. As the French speaking region of the country is known to have a lower nutritional status,<sup>6</sup> this may lead to underestimation of obesity prevalence and of geographical inequality.

The Robin Hood Index is poorly suited for transfer of obesity/overweight between two municipalities located on the same side of the mean. However, the Lorenz curves are mostly parallel (not shown here), which means that the overall distribution is stable in time: hence, the use of such an index is appropriate.

While a global and coherent strategy to tackle obesity is emerging,<sup>7</sup> this work

highlights the need for monitoring and strategies taking into account the geographical inequality of such a risk factor. It is, in fact, very likely that other cardiovascular risk factors may show similar geographical inequality. WHO Cardiovascular Monitoring projects have been developed in Belgium since 1985 in three areas. They can be helpful to track such inequalities.

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