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Body mass, obesity and fitness among young men

by

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Abstract

Objectives: *– To assess the evolution of body mass (BMI), obesity and overweight among conscripts*
– To test variations according to age, region, language.

Basic procedures: *Belgian conscripts underwent a clinical assessment: about 48 500 annually (= cc 71% of Belgian males). For 631 327 conscripts (1978-1990), BMI, obesity and overweight were analysed in relation with time trend, "age-class", region, language and decision about fitness. Statistical analyses included: oneway, Student-Newman-Keuls, ANOVA, Multiple classification and Chi-square tests.*

Main findings: *All analyses showed very significant associations.*

Time trend: *BMI increased: + .65 kg/m^2, taking into account region and "age-class"; the prevalence of obesity more than doubled; that of overweight was multiplied by at least 1.3 (up to age 24).*

"Age-class": *BMI was significantly higher for the eldest (26+) compared to the youngest (18): + 1.12 kg/m^2, taking region and time trend*

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into account. However "age-class" is linked to education: university graduates underwent the test at an older age.

Region: *BMI was always higher in Wallonia: + .45 kg/m*^{2} *versus Flanders, taking "age-class" and time trend into account.*

Medical assessment: *10.1% of the conscripts were rejected for medical reasons; 16.5% were refused when the BMI reached 30, up to 77% from BMI 40 on. Those exclusions represent about 7% of all young men concerned (including those who did not show up at the examination); outside the procedure under review, an extra 5% were exempted for medical reasons.*

Conclusions: *The time trend in BMI proved very significant. BMI was linked to age-class and region. Obesity strongly affected inability to join the armed forces. Due to the risks associated to obesity, action should be taken.*

Keywords

Body mass, Body-mass index, obesity, body weight, fitness, health status, aptitude, young men.

1. Introduction

1.1. Objectives and Hypotheses

- To assess the evolution of body mass index (BMI), obesity and overweight among conscripts;
- To test if those indicators vary according to age, region, language.

1.2. Background

Between 1978 and 1990, more than 631 000 Belgian young men underwent a clinical assessment, aiming at assessing fitness for compulsory enlistment in the army. Decisions had to be taken upon recommendations by three medical doctors, made after a standardised medical examination, based on clinical judgement and on a battery of functional and biological tests; official criteria (AR 5/11/1971, plus further changes) were decided by a Commission of twenty members (AR 19/5/1951, plus further changes); following factors had to be taken into account:

- robustness, resistance to efforts, functional fitness of various systems,
- morphology and functionality of upper and lower limbs, pelvis and backbone,
- hearing and visual acuity and perception of colour,
- mental abilities (including understanding, memory, concentration and attention),
- emotional stability.

For each factor, a score had to be given on a five points scale; a five means "unfit for joining the army". The criteria for deciding upon the scores were provided by detailed rules (Inter Forces 51, 154 pages), describing the anamnesis, the clinical exams, the tests to be performed and the way to perform them, together with rules about interpretation.

About 48 500 men showed up every year, providing a data basis of 631 327 observations. The remaining cases concern those for which information was incomplete (0.5%), the deserters or those exempted earlier in the process, for various reasons including disability (about 5%), voluntary enrolment for a career in the army (4-5%), as well as "moral reasons", *i.e.* work abroad for developing countries, being a conscientious objector or the main wage-earner or the fifth child in the family, or the third one to be enrolled in the army or victim in duty for the country. All exemptions from compulsory service (either previous to or based on the central medical examination), were granted by Commissions set up in each department (9 "provinces" in Belgium). Exemption rates were higher among French speaking then among Flemish speaking young men. Those exempted belong as well to groups in poor health (*e.g.* disabled) as to groups in good health (*e.g.* voluntary enrolment). But the % unfit for medical reasons was higher in those who were not examined during the procedure under review. Nothing is known about the possible differences in weight and height between the latter groups.

We analysed BMI, obesity and overweight, *i.e.* variables for which links with mortality and morbidity are widely documented. Leanness can be a risk factor too (1). We computed BMI by weight(kg)/height(m)^2, rather than kg/m^3 or skinfold thickness. BMI is a valid surrogate for fatness in the normal semisedentary population (2) and has been recommended by various panels sponsored by the National Institute of Health (3, 4). It has strong assets: it is predictive of later obesity (5); it has high correlation's with skinfold thickness (6, 7) and total body fat (8).

The thresholds for obesity (BMI > = 30) (9, 10, 11) and overweight (> = 25) (11, 12, 13, 14, 15) tally with international literature. For under-weight we used BMI < 18. The official cut-off point for exempting from military services were: under 18 and over 31 (but were not always used: see section 4.3). The army rules set the level for overweight at over 25.

2. Methods

We used records from the Belgian army. Regions were allocated through the postal code. "Age" is approximate (year of assessment minus year of birth). Data were available about weight (noted in kilograms), height (rounded down to the nearest centimetre) and language spoken, enabling to split conscripts living in the bilingual region of Brussels. Oneway analyses enabled to test which pair(s) of adjacent ages differed significantly for BMI [Student-Newman-Keuls test (= SNK) at the .05 level]. Multivariate analyses were performed (ANOVA). Multiple classification analyses (MCA) assessed the contribution of each subgroup. For differences of frequencies, we used Chi-square tests.

3. Results

For cohorts aged 19 at the beginning of the study (1979-81), we could sum up all those examined whatever the year (1978-1990): we covered about 70-72% of the young Belgian males. The selection procedures occurring at various ages, the coverage per age was much lower.

3.1. Body Mass Index

3.1.1. Main results

Only the main results are described hereunder. Summaries appear in table 1 and table 2.

- The median BMI observed for all conscripts under review was: 22.13
- ***Six "age-classes" showed BMI significantly different*** across time[i]: 18, 19, 20, 21-23, 24-25 and 26+; quotation points are used because of the probable link with education (see discussion).
- ***Independent variables appeared highly significant:***
  The ***time trend was distinct*** for each "age-class" and each region (F test: $p = .0000$, Brussels: $p < .05$). **"*Age-class", region and year of***

[i] Student – Newman – Keuls tests, level $p < .05$; ONEWAY – SPSS procedure.

TABLE 1

BMI: main results (average and standard error)

BODY MASS INDEX					
	1978	1990			
Age or Age-class	Belgium	Belgium	Brussels	Flanders	Wallonia
(17)-18	22.02 ± .05	22.68 ± .10	22.61 ± .37	22.66 ± .12	22.77 ± .20
19	22.08 ± .04	22.83 ± .07	22.45 ± .27	22.77 ± .09	22.99 ± .15
20	22.29 ± .07	23.01 ± .07	22.72 ± .33	22.81 ± .10	23.43 ± .16
21-23	22.58 ± .05	23.23 ± .05	22.99 ± .19	23.04 ± .06	23.65 ± .10
24-25	22.96 ± .09	23.41 ± .08	22.94 ± .22	23.29 ± .11	23.75 ± .16
26+	23.15 ± .14	23.62 ± .15	23.23 ± .33	23.59 ± .22	24.11 ± .29

Probability of no effect
- age class: .000 every year
- region: .000 every year
- interaction: 5 years out of 13

Probability of no time trend, taking region into account: For each age class: p = .000
(Anova analyses, for each age-class, including region and year of observation)

conscription appeared very significant, as well for their main effects, as for their interactions (p = .000 in all cases, ANOVA) . However R^2 remained low.

3.1.2. Details of associations

*BMI slightly increased with **"age-class"***: e.g. in 1990, from 22.68 kg/m^2 (± .10) at "age" 18, up to 23.62 (± .15) at age 26+; this difference between the youngest and the eldest was significant. The differences were highly significant every year when controlled for region or language[ii]. The multivariate analysis (MCA) slightly increased the differences (+ 1.12 kg/m^2), when controlled for region *and* time trend.

The effect of **region** was always highly significant when controlled for "age-class" (p = .000 each year[iii]). Wallonia (a region less well off) shows a higher BMI[i]; when controlled for "age-class" and year, the difference reaches + .32 kg/m^2, contrasting with Brussels (– .24) and Flanders: – .13 (MCA). Consequently, BMI was *lower among Flemish speaking young men* for each "age-class" (p = .000[ii]).

[ii] ANOVA analyses for each "age-class", including region (or language spoken) and time trend as factors.

[iii] ANOVA analyses per year of observation, including region (or language spoken) and "age-class" as factors.

Within regions, provinces differed significantly (p of F = .000 for almost all “age-groups”). Within each province, districts usually did not. It is worth noting that in Wallonia, the heaviest young men lived in Hainaut, a rather deprived area.

Time trend – *BMI increased* between 1978 and 1990: from 22.32 to 23.09 on average. The increase occurred for all “age classes” and i*n all three regions*, particularly in Wallonia (+ .82 kg/m^2) (Fig. 1).

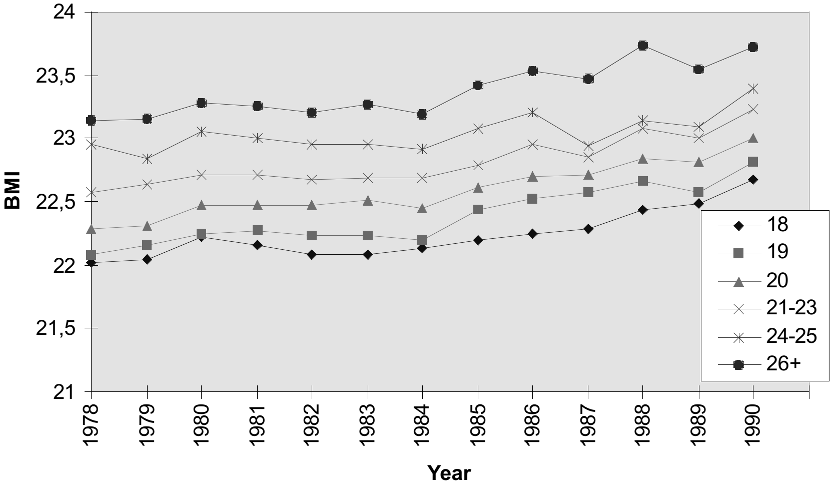

Fig. 1: BMI: evolution by “age-class” among conscripts

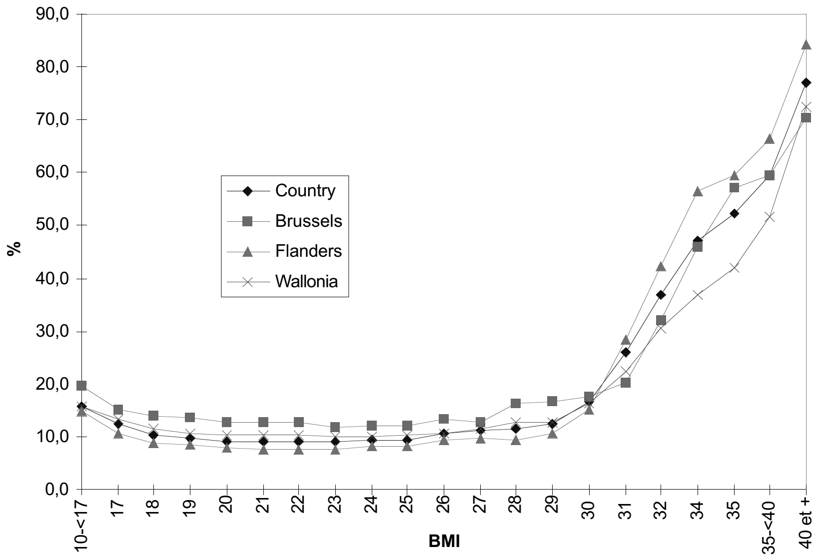

Fig. 2: Percentage of conscripts non fit for joining the armed forces, according to BMI

TABLE 2

Percentage of obese and overweight: main results (% and standard error)

	Obesity (BMI > = 30)						Overweight (BMI > = 25)					
	1978	1990					1978	1990				
Age or Age-class	Belgium	Belgium	Brussels	Flanders	Wallonia	(a)	Belgium	Belgium	Brussels	Flanders	Wallonia	(a)
(17)-18	2.0 + .4	4.2 ± .5	2.9 ± 1.8	4.4 ± .8	4.3 ± 1.3	12	12.8 + 0.6	18.4 + 1.1	16.2 + 3.9	17.8 + 1.4	20.5 ± 2.4	12
19	1.8 + .3	4.3 ± .4	3.2 ± 1.6	3.8 ± .4	5.8 ± .9	12	12.9 + 0.5	20.0 + 0.8	16.3 + 3.3	18.9 + 1.0	23.1 ± 1.6	7
20	2.0 ± .4	4.5 ± .5	5.4 ± 2.1	3.4 ± .5	6.8 ± 1.0	13	13.9 + 0.9	21.3 + 0.9	18.9 + 3.6	19.3 + 1.1	25.8 ± 1.8	13
21-23	2.0 ± .2	4.1 ± .3	3.6 ± 1.0	2.9 ± .4	6.3 ± .6	13	17.0 + 0.7	23.5 + 0.7	20.4 + 2.4	21.4 + 0.9	28.2 ± 1.3	13
24-25	2.7 ± .5	3.8 ± .5	2.7 ± 1.2	2.9 ± .7	5.6 ± 1.0	12	21.8 + 1.2	24.6 + 1.1	19.2 + 3.0	23.6 + 1.6	27.7 ± 2.0	11
26+	2.8 ± .8	4.7 ± 1.0	4.2 ± 2.1	3.1 ± 1.3	6.2 ± 1.9	4	24.1 + 2.0	29.6 + 2.1	24.5 + 4.5	28.2 ± 3.2	33.4 ± 3.5	7

Tests on differences between age classes (b) 1978: p < .01 1990: NS

Tests on time trend (c) (Mantel-Haenszel test)

Obesity:
Country: p < .001 for each age-class
Flanders and Wallonia: p < .001 for each age-class < 24
p < .01 or .05 at older ages
Brussels: p < .001 or < .01 between 19 and 23

Overweight:
Country and Flanders: p < .001 for each age-class
Wallonia: p <.001 for each age-class < 24
p < .01 at older ages
Brussels: p <.001 between 19 and 23

(a) Number of years of observation (out of 13: 1978-1990) for which there is a significant difference between regions (P of $Chi^2 \leq .05$). Before 24 y of age, usually p < .001.

(b) Chi^2 tests are performed on plain numbers, all years together and for the whole country.

(c) Tests on time trend are performed separately for each “age-class” (for the country, then per region).

The year of conscription was very significant, as well as main factor, as in interaction with region and "age-class" (p of F = .000). When the latter were controlled, *the increase still reached .65 kg/m^2, i.e. almost a 3% increase within 13 years (MCA).*

Fitness – After clinical assessment, 10.1% of the conscripts were not enrolled (8.9% in Flanders versus 13.6% in Brussels, p = .0000). With a BMI 18-26, < 10, 5% were declared unfit; at level 30, the % jumped at 16.5% and rose rapidly up to almost 77% from BMI 40 on (significant from BMI 29 on) (Fig. 2). The very lean were also more often unfit, but much less frequently: 15.8% when BMI was < 17. The overall % of men unfit is higher (see section 4.3).

3.2. Obesity and overweight

Our main results appear in Table 2.

The prevalence of obesity (4.2% ± .4 in 1990) did not increase with "age-class"; that of overweight did: from 18.4% (± 1.1) at age 18, up to 24.6% (± 1.1) at age 24-25 (p = .0000[iv]).

Whatever the "age class" (< 26 years), the prevalence of obesity was significantly different according to the region [for either 12 or 13 (according to the age-class) out of the 13 years under review]; it was mostly higher among *French speaking young men and always higher in Wallonia*, particularly compared to Flanders, *e.g.* 4.3 to 6.8% in Wallonia (according to "age-class"), compared to 2.9 to 4.4% in Flanders in 1990 (see Fig. 3).

The *prevalence of obesity more than doubled:* from 1.8 – 2.8% in 1978 (according to "age-class") up to 3.8 – 4.7% in 1990*;* it *increased for the country, for each region and each "age-class"* (usually p < .001, in each "age-class"[iv]).

The *prevalence* of overweight was multiplied by at least 1.3 (up to age 24), as measured by the worst hypothesis of confidence intervals. It was more frequent among French speaking young men: 16.6% *versus* 13.7% among Flemish speaking ones (p of Chi^2 < .01, until 1988). The difference *between regions* was usually significant (p < .01), mainly due to Wallonia: 17.1% *versus* 13.6% in the other two regions; so were the differences between years of conscription: for all "age-classes", for the

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[iv] Mantel-Haenszel test for linear association.

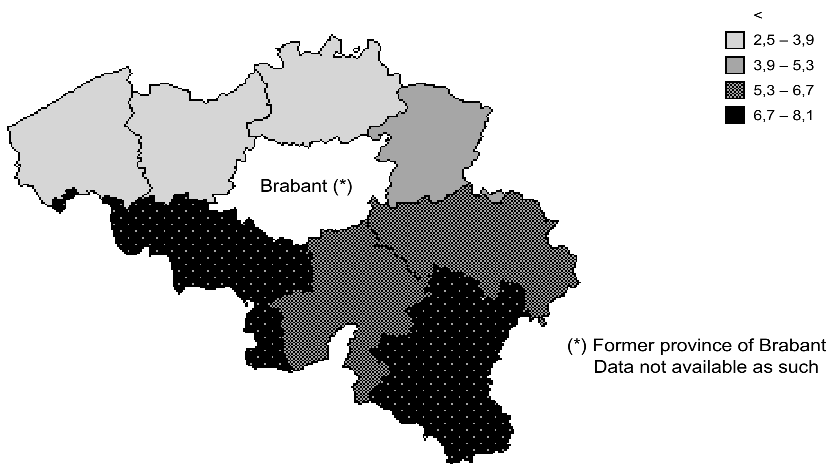

Fig. 3: Obesity:% of conscripts per department (province): 1990, conscripts 20 years old

country as a whole and in a multivariate analysis (p = .0000 (18)). Furthermore, overweight increased, with "age-class", e.g. in 1990: 29.6% (± 2.1) among the 26+, compared to 18.4% when 18 years old (highly significant, except between contiguous classes).

4. Discussion

4.1. Possible biases

Official rules foresee that height and weight are encoded without decimal place. On average, the difference is very small between the mean of all possible real BMI (computed with values including one decimal place) and the recommended way of encoding. Provided the latter was well known and applied, BMI could be slightly underestimated when weight is low (< 75 kgs): – 0.007 to – 0.25%; it might have been slightly overestimated for heavy weight (> = 110 kgs): < = 0.09% if height > = 1.8 m; in between, it could mostly be slightly underestimated, except when height is small versus weight (e.g. < = 1.6 m for 80 kgs, < = 1.8 for 90 kgs, ...), *i.e.* for overweight of obese men. Consequently, for values which are near the critical points (25 and 30), a few cases may have been ill-classified due to the lack or decimal places, but such inaccuracies could occur both ways, so that no systematic bias has to be feared; furthermore, there is no reason that it would systematically vary among the groups observed, so that the comparative analyses remain valid.

In our study, "age-class" is probably linked to education level: university graduates usually undergo the military assessment from age 21 on, later than blue collar workers (between 18 and 21).

We cover about 70% of all young men; exemptions for medical reasons are more numerous in the remaining group (see section 4.3).

4.2. Comparisons with other countries

4.2.1. Overall comparisons

With averages between 22.7 and 23.6 (table 1), Belgian conscripts were lighter than young white men in the US (16) and than an adult population in the same country (17) (which is normal, since they belong to the youngest classes). Results are very similar to those of the Cardia study in four USA cities (18).

TABLE 3

Percentage of obesity and overweight in various studies

	Overweight		Obesity		
Author	Definition	%	Definition	%	Population under review
Martinez 1999		36.6	BMI >/= 30	10 7-12	European Union, aged 15+ Italy, France, Sweden versus UK
Kuskowska-Wolk 1993	BMI > 25		BMI > 30	1.5-1.1	Swedish men aged 16-34, 1980-89
Lissner 2000			BMI >/= 30	6.6 10.0	Swedish men aged 16-84, -1980/81, -1996/97 rates adjusted for self-reporting
Brohet 1991				15.2/21.5	Male/female Belgium 1983-85
Gurney-Gorstein 1988				5.4 to 9.9 1.9 – 4.0	Netherlands, UK, Italy, men 45-50 Netherlands, UK, Italy, men 20-34
Gallagher 1999		54			American adults
Stamler 1993		45			Young white men USA (NHANES II)
Devos 1986	20% > "normal"	8			School boys 16-19; Liège 1984-85

The prevalence of obesity among young men (table 2) is similar in other European countries, except Sweden (13, 19) and of course lower than in an adult population (10% in Europe 15 y+ (20, 21), 6.6% for Swedish men in 1980-81 up to 11.9% 1996-97 (table 3) (10, 22). Overweight (18 to 30% in 1990, according in "age-class") was much less frequent than in the USA (45-54%) (23, 24, 25) and even in Europe (31-33.6%) (20, 21) but of course higher than for schoolboys (26).

4.2.2. Associations with age

A follow-up study of American twins has shown an increase of BMI with age (27). However, a few documented results show no age-related increase in fatness in a few adult populations; this argues against the hypothesis of a natural evolution (28).

4.2.3. Associations with socio-economic variables

Several studies have shown that *BMI and prevalence of obesity* are inversely associated with education (29, 30, 31) and/or social class or income (13, 20, 26, 32, 33, 34, 35, 36, 37). Consequently, increase of BMI per "age-class" in our study is probably underestimated (due to the older age of university graduates). For other authors though, such links are unclear and often non significant (5, 6, 16, 38).

The secular trends in BMI are unfavourable for groups with lower education and income: the latter show the greatest increases in BMI and prevalence of overweight over time (24, 30).

For women too, inverse relationships were observed (39); the concern with overweight rather than the tendency to get fat probably distinguishes women of different socio-economic levels (38).

4.2.4. Associations with regions or ethnic groups

Significant differences per geographical area have also been found in various other studies.

BMI: For Swedish women, there was a 10% difference between extremes (40). For Japanese men, the average BMI was lower in Japan than in California or Hawaii; the percent caloric intake of fat was twice greater in Hawaii (41).

Overweight or obesity: Regional differences are reported between German-speaking regions (42), in Sweden (40) and between the Baltic Republics (43). In Brazil, the wealthier South had higher prevalence of overweight and obesity than the poor rural Northeast (44). On the contrary, in a wealthy country such as Belgium, it is the least well off region (Hainaut), which suffers from higher rates in this field, for reasons which have still to be assessed; the French-speaking region is known to have a lower nutritional status (45), but nutrition too is influenced by socio-economic status (46, 47); analysing our data per municipality, it has been shown that poorer municipalities had 3% more overweight and 8% more obesity, compared with better off areas (48). The unfavourable impact of poor living conditions on BMI or on obesity can be drawn from studies in Scotland (type2 diabetics) (49), or those which compared areas within London (50), underdeveloped countries (51), or ethnic groups in New Zealand and Australia (52, 53).

4.2.5. Time trends

Increases were observed in several studies around the world for both indicators.

BMI: For both Swedish men and women, an increase occurred during the 1980s, especially for men aged 25-34 (+ .45); after adjustment for education, socio-economic group, region and nationality, increase was confirmed, except for the 16-24 age group (13). Other studies in various countries and socio-economic groups confirmed these findings (10, 38, 44, 54, 55, 56, 57, 58, 59), with a recent trend showing more intense increases among men, rural areas and poorer families (60). There were a few exceptions (61, 16), no trend in developing countries (51) or even decreases for specific groups, (e.g. women in China (62) or urban women in Brazil (60).

Obesity is increasing fast in the world (63, 64, 65), however only for women in the USA (18-34 y) (66). A similar trend has been observed for older Belgian men (40-54 years): prevalence of obesity increased from 8% in 1977-78 up to 13.5% in 1992-93; that of overweight jumped from 54.4% up to 68.2%; in the latter population, obesity was related to low education, less exercise, high intake of fat and increase of the ratio lipids/carbohydrates (67). Obesity is also more frequent among children in industrialised countries, leading a few authors to suggest that this might lead to a public health problem that could reverse the recent decline in morbidity from cardiovascular diseases (68, 69) and could weigh heavily on the social security/disability systems (70, 71), *inter allia* due to the cost of associated comorbidities (72).

Overweight is climbing too: + 15% for Swedish men aged 16-34 during the 1980s (40); smaller increases were reported in the USA (56, 73).

4.3. Level of fitness

4.3.1. The overall level of men unfit reaches 12%

During the medical examination under review, about 10% were assessed as unfit for joining the army; since about 70% underwent the test, those rejected represent about 7% of all young men concerned. Previous to this examination, an extra 5% were exempted for medical reasons (*e.g.* handicapped). The overall level of men unfit thus reaches about 12% on average.

4.3.2. Impact of obesity

At all levels of obesity, a percentage of obese remained fit for service in the army (see Fig. 2 showing % of unfit). The share of exemption sharply increased with the level of BMI (from 16.5% at level 30, up to 77% at level 40). Such figures are low, since the official criteria allows exemption at BMI over 31. The % exempted was always higher for Walloon conscripts; as the same MDs were examining conscripts of both languages, it cannot be due to just more severity on one side. The reasons for exemption can be twofold: a/ either other medical conditions were observed and conscripts were declared unfit because of their actual health status or b/ obesity was considered as a risk factor; the decision would then reflect a careful attitude. The higher rate for Walloon conscripts might be due to a larger proportion of reason "a", *i.e.* more related comorbidity.

4.4. Factors of obesity

A better understanding of the factors of obesity may contribute in drawing intervention patterns (27).

Recent studies are looking for the role of genes (74, 75, 76, 77, 78, 79). Several studies had already shown the effect of ***heredity*** (27, 80, 81, 82). However, they disagree: either genetic factors seem to influence BMI much more than childhood environment (81), or their influence seems low compared to environmental and social factors (83).

Obesity starts early: Obese infants, adolescents and young adults are more likely to become obese adults (84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94). Having an obese parent increases the risk of becoming obese (95) and the likelihood is greater when the number of obese patients in the ***immediate family*** is larger (93); this factor also increases the risk for obese children of remaining obese (84).

Life-styles also play a role (96), particularly: a more fatty diet and the increase of the ratio fat/sugar (17), saturated fat, alcohol or salt (23), protein intake (97); eating school lunch and skipping breakfast (37); television viewing (98); and for women: alcohol and smoking (1).

For adolescents, significant associations were found with time spent watching television; the latter affects energy intake (food is advertised) and consumption: less energy required than for outdoor activities (99). Time involved is important; e.g. according to type of education, 17 to 35% of Belgian school boys spend daily more than 4 hours watching TV (100).

For children at 5, associations were found with television viewing and lack of sleep (68).

However, a few studies question such results (101, 102, 103); even Locard (69) showed that plain associations disappeared after allowing for parental obesity.

An ***inverse association*** has been shown with physical activity (in a few cases for white women only) (55, 97, 104, 105). ***No association*** could be found with coffee, decaffeinated coffee, tea, fruits and vegetables, nor with estimated caloric intake or reported diet (32).

Socio-economic factors are important: perceived stress and unemployment (106), income (44); black population (107), American Indian children (108), Blacks and Hispanics (73), black women (109, 110), and for women: education (1), marriage and number of children (32); for children: parents' country of origin: Italy, Spain or Portugal in France (68); and Italian origin in Belgium (26), maybe because of late and abundant evening meal. Socio-economic status also plays a role through its influence on life-styles: an inverse relationship with smoking (71), a direct link with dieting (111), weight control (112) and physical activity (113, 114).

5. Conclusions

Between 1978 and 1990, cc 70-72% of the Belgian young men underwent a clinical assessment, aiming at assessing fitness for compulsory enlistment in the army. About 48 500 men showed up every year, providing a data basis of 631 327 observations. As to the remaining 30%, they could avoid the medical examination in various cases including ill-health (about 5%) as well as voluntary enrolment (sign of good health: also about 4 to 5%); remaining cases pertain to “moral reasons”. Those who did not show up thus include more medical cases. Nothing is known about their specific height and weight. We computed the body mass index (kg/m^2). BMI and prevalence of obesity and overweight were analysed in relation with time trend, "age-class", region, language spoken and decision about fitness. Very significant associations were found in all cases.

Time trend – It is striking: BMI and prevalence of obesity and overweight increased between 1978 and 1990, rather sharply within such a short period; the prevalence of obesity, a high risk factor for health, has more than doubled; that of overweight has been multiplied by at least 1.3 (up to age 24). The three indicators of body mass thus show an obvious worsening.

"Age-class" – BMI increased with "age-class": + 1.12 kg/m^2 between the youngest and the eldest, taking into account the influence of region and time trend.

Region – BMI was always higher in Wallonia compared to the other two regions: on average + .56 kg/m^2 compared to Brussels, when the influence of "age-class" and time trend was taken into account. BMI was always lower among the Flemish speaking young men.

Medical assessment – The influence of obesity on exemption was striking: with a BMI 18-26, 10.5% were refused, whereas the refusal rate reached 16.5% for a BMI of 30, up to 77% from BMI 40 on. The overall level of young men unfit for the army reaches 12%, taking into account those exempted through other procedures.

Action – Due to the risks associated to obesity according to international literature, action should be taken: on dietary habits and amount of physical exercise. Guidelines should be followed by structural changes in the environment, health education programmes, *inter allia* through general practitioners (115), and in specific cases, by psychotherapeutic support. Main target populations are younger people: early intervention is advocated (116, 117), mainly for those with obese parents; programs should aim at preventing weight increase and maintaining weight losses.

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Résumé

Objectifs: – Estimer l'évolution de la masse corporelle, de l'obésité et de la surpondération parmi les conscrits
– Tester les variations selon l'âge, la région et la langue.

Méthodologie: Quelque 48 500 conscrits ont subi annuellement un examen médical (= ± 71% des hommes Belges). Pour 631 327 cas (1978-1990), l'indice de masse corporelle (BMI), l'obésité et la surpondération ont été analysés en relation avec l'évolution chronologique, la "classe d'âges", la région, la langue et la décision relative à l'aptitude au service militaire. Les analyses statistiques utilisées sont: oneway, Student-Newman-Keuls, ANOVA, classification multiple et tests de Khi^2.

Principaux résultats: Toutes les analyses se sont révélées très significatives.

Evolution temporelle: La masse corporelle a cru: + .65 kg/m^2, en tenant compte de la région et de la "classe d'âges"; la prévalence de l'obésité a plus que doublé; celle de la surpondération a été multipliée par au moins 1.3 (jusqu'à 24 ans).

"Classe d'âges": La masse corporelle est significativement plus élevée pour les aînés (26+) comparés aux plus jeunes (18): + 1.12 kg/m^2, en tenant compte de la région et de l'évolution temporelle. Toutefois, la "classe d'âge" est liée à l'éducation: les diplômés universitaires subissaient le test à un âge plus élevé.

La Région: La masse corporelle était toujours plus élevée en Wallonie: + .45 kg/m^2 par rapport à la Flandre, en tenant compte de la "classe d'âge" et de l'évolution temporelle.

Décision médicale: 10.1% des conscrits furent rejetés pour des raisons médicales lors de l'examen étudié ici; quand le BMI atteignait 30, le taux de refus était de 16.5%; il atteignait 77% pour les BMI de 40 ou plus. En tenant compte des exclusions pour raisons médicales survenant à un stade antérieur de la procédure, ces exemptés représentent quelque 12% des jeunes hommes.

Conclusions: L'évolution chronologique de la masse corporelle s'est révélée très marquée et significative. La masse corporelle est liée à la "classe d'âges" et à la région. L'obésité influence fortement l'inaptitude au service militaire.

Compte tenu des risques associés à l'obésité, des programmes de santé publique devraient être mis en œuvre.

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