Secular trends in BMI and the prevalence of obesity in young Polish males from 1965 to 2010

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Background: Obesity is a serious public health problem, the prevalence of which is increasing dramatically all over the world. The aim of this study was to examine trends in body mass index (BMI) and the proportion of overweight and obese individuals among 19-year-old Polish males reporting for mandatory military fitness exams from 1965 to 2010. Methods: Height, weight and BMI [weight (kg)/height (m^2)] in five 10% nationwide random samples of 19-year-old conscripts examined in 1965, 1986, 1995, 2001 and 2010 were analysed. Results: From 1965 to 2010, mean BMI in 19-year-old Polish males increased from 21.7 to 22.9. The rate of change was not uniform, with a rapid increase in mean BMI from 1995 to 2010. Beginning in 1965, the proportion of men with a BMI over 25 has been steadily increasing from one decade to the next, and was four times higher in 2010 than it was in 1965. The rate of increase per decade was twice as high from 2001 to 2010 than it was from 1995 to 2001. In 2010, only 70.8% of young men were of ideal weight. Conclusion: Increase in obesity can be attributed to the social and economic changes brought about by the transformation of the country from a communist to a free-market economy in 1989. The challenges of the obesity epidemic for public health services and its impact on morbidity and life expectancy are also discussed.

Methods

This study is based on five nationwide surveys of Polish conscripts carried out in 1965, 1986, 1995, 2001 and 2010. Subjects were measured during a compulsory, medical examination at district recruiting boards throughout the country. All recruiting boards were asked to provide information on the first, and subsequently every 10th subject reporting for the examination. The sampling method yielded a 10% random national sample representing all social strata and all regions of the country.

Body height and body mass were measured by trained nurses. During the examination, the examinees wore only light underwear and were not wearing shoes. Body height was measured to the nearest 1 mm, and body mass to the nearest 0.1 kg. Measurements were performed in accordance with the procedures described by Martin and Saller.10 The BMI was calculated using the following formula: BMI = m/h^2 where m equals body mass in kilograms, and h equals body height in meters. The degree of obesity was estimated using the threshold values published by the World Health Organization.11 Individuals with a BMI of less than 18.5 were considered underweight. Those with a BMI between 18.5 and 25.0 were considered to be of normal weight. Those with a BMI ≥ 25.0 were considered overweight. Those with a BMI ≥ 30 were considered obese.

Introduction

Obesity has become one of the most serious health problems in almost all countries, both industrialized and developing. In 2008, more than 1.4 billion adults were overweight. Of these, over 200 million men and about 300 million women were obese. More than 40 million children under the age of five were overweight.1 Still in European countries, from 32 to 79% of men are overweight, and 200 million men and about 300 million women were obese.2 More than 1.4 billion adults were overweight. Of these, over 200 million men and about 300 million women were obese. More than 40 million children under the age of five were overweight.1 In 2008, more than 1.4 billion adults were overweight. Of these, over 200 million men and about 300 million women were obese. More than 40 million children under the age of five were overweight.1 Still in European countries, from 32 to 79% of men are overweight, and 200 million men and about 300 million women were obese.2 In Europe, from 32 to 79% of men are overweight, and 200 million men and about 300 million women were obese.2

Obesity has major health consequences. In adult Europeans, it is implicated in about 80% of cases of type II diabetes, for about 35% of cases of ischaemic heart disease, and about 55% of cases of hypertension.2 Furthermore, obesity has an increasing impact on national economies because of the costs associated with treating chronic disorders caused by obesity and with lost productivity caused by absenteeism. Calculations in the USA indicate that people with a body mass index (BMI) exceeding 30 kg/m^2 had 36% higher annual health care costs than those within the normal weight range.3 Based on studies on obesity and longevity in the United States, the rising rate of obesity, especially among young people, may soon cause a decrease in life expectancy if this trend is not reversed.4

BMI has also been increasing all over the world. The scale and pace at which the epidemic is developing is reflected in population-level trend data, which are available for some countries. In Denmark, for example, the proportion of overweight individuals increased by about 1.2% a year for women and 0.9% a year for men from 1987 to 2001.5 The increase in obesity has been especially dramatic among children and adolescents. In Switzerland, the proportion of overweight children increased from 4% in 1960 to 18% in 2003. In the United Kingdom, it increased from 8% in 1974 to 20% in 2003. In some European countries, the proportion of overweight and obese children and adolescents is increasing up to 2% a year.5

In Poland, inter-generational studies on changes in BMI reveal that body weight in Polish men and women started to dramatically increase in the late 1990s, or 30 years later than in Western Europe.5–9 This coincides with the social and economic changes brought about by the transformation of the country from a communist to a free-market economy. The aim of this study was to examine trends in BMI and the proportion of overweight and obese individuals among 19-year-old males reporting for mandatory military fitness exams from 1965 to 2010, with special attention paid to individuals born in 1991, that is, after the transformation of the Polish economy from a communist to a free market economy.
Changes in BMI and proportion of individuals who were overweight and obese were expressed in terms of kg/m² per decade and percent per year, respectively. To compare results from different cohorts, the coefficient of variation was used. To evaluate the distribution of BMI within selected cohorts, the coefficients of skewness and kurtosis were calculated. The statistical significance of secular trends for the traits analysed was evaluated using one-way analysis of variance. Data were analysed using the STATISTICA 10.0 software package.

Results

Over the course of the study period from 1965 to 2010, mean BMI in 19-year-old Polish males increased from 21.73 to 22.94 (figure 1). The rate of change was not uniform. Between 1965 and 1986, there was only a slight increase of about 0.12 per decade. There was no change at all between 1986 and 1995, and a rapid increase in mean BMI from 1995 to 2010. There was an increase of 0.97 from 1995 to 2010, with an increase of 0.76 from 2001 to 2010 (table 1).

Furthermore, the variance in BMI has been increasing in each successive decade, which indicates that variability in this trait has been increasing over time (table 1). The distribution of BMI in selected cohorts is illustrated in figure 2. Comparing the frequency of men with given values for BMI from 1965 to 2010 reveals that two very important changes have taken place during that time period. First, there has been a large decrease in the proportion of men with a BMI of between 18 and 23, and a clear increase in men with a BMI of over 24. Furthermore, there were no men with a BMI over 35 in 1960, while there were 191 such men in 2010, which represents 0.9% of the sample. Between 1965 and 2010, the distribution curve of BMI has distinctly changed shape, with a doubling of the skewness and kurtosis coefficients (figure 2).

The increase in mean BMI was accompanied by a significant increase in the proportion of men who were overweight and obese (table 2). Beginning in 1965, the proportion of men with a BMI over 25 has been steadily increasing from one decade to the next, and was four times higher in 2010 than it was in 1965. The rate of increase per decade was twice as high from 2001 to 2010 than it was from 1995 to 2001. In 2010, only 70.8% of young men were of normal weight. The proportion of underweight men, conversely, has remained steady since 1995.

Discussion

According to WHO, relative body mass is generally considered to be an indicator of nutritional status and quality of life in a given population. The changes in BMI observed over the last 45 years in Poland clearly show that diametric changes in lifestyle took place in the latter half of the 1990s. From 1965 to 1995, there were only modest changes in BMI. After that point, BMI rapidly increase by almost one unit in the last 15 years. These changes are due to the change from a communist to a free-market economy and the resulting changes in the socio-economic status of Polish families. The first years of the economic transformation, from 1989 to 1993, were known as the ‘shock treatment’ period. During this time, there was a large drop in Gross National Product, a large increase in unemployment, and hyperinflation that reached as high as 586% in 1990. Real household income decreased, and households curtailed spending on food, with both the quantity and quality of food consumed decreasing. Families also spent less on recreation and medical care. There was a decrease in the consumption of lean meat and fresh fruits and vegetables, and an increase in the consumption of starch.12 This affected the health status of the population.13 That is why no increase in BMI was observed between 1986 and 1995.

After 1995, the Polish economy began to pick up. Inflation fell to 5.5% in 2001. Real household income has increased.14 There was a marked increase in body mass in young men.15 There has also been a marked increase in BMI, especially after 2001.

The adoption of cultural, economic and political models from Western Europe and North America has been referred to in the literature as ‘westernization’. In Poland, as in other former Warsaw Pact countries, westernization has had negative consequences on the nutritional regimen of whole families. There has been an increase in the consumption of low-quality energy dense foods based on fats and carbohydrates, which has caused a major increase in body mass in the population. There has also been an
increase in the availability of junk food, fast food and soft-drinks, driven by aggressive advertising on television and the internet. The rise in material wealth has made it possible for Poles to purchase consumer goods like automobiles, television sets and computers, which has led to a decrease in physical activity in both adults and children. The lifestyle has become more sedentary, with an increase in hours spent in front of the television or computer.

In all developed countries, bad dietary habits and minimal physical exercise have resulted in an increase in BMI. In Sweden, for example, BMI was 22.7 in 19-year-old males born in 1990, whereas it had been 22.1 in 19-year-old males born in 1974.16 In Austria, BMI in 18-year-old males examined from 2001 to 2005 was, on average, 22.9, whereas it had been 22.4 in males examined from 1986 to 1990, an increase of 0.5 units in 15 years.17 In Hungary, BMI in young males increased by 0.8 units from 1973 and 1998.18

Together with the increase in mean BMI, there has been a marked increase in the proportion of individuals who are overweight and obese. In Europe at the present time, the proportion of adults with a BMI over 25 is almost 80% of men and women in Albania, and about 65% of men and 60% of women in both Bosnia-Herzegovina and Scotland. The lowest values are found in Turkmenistan and Uzbekistan, with about 30% of adults with a BMI over 25.2 Poland lays somewhere in the middle, with 57% of men and 49% of women with a BMI over 25.2

Especially disconcerting is the fact that obesity is more and more increasing particularly in children. In Poland, not quite 12% of 19-year-old conscripts had a BMI over 25 in 1995. By 2010, the proportion had increased to 23%. Not a single 19-year-old male had a BMI over 35 in 1960, whereas 0.01% (n = 4) did in 1986, 0.2% (n = 58) did in 1995, 0.4% (n = 128) did in 2001 and 0.9% (n = 191) did in 2010.

Similar increases in the proportion of clinically obese individuals have also been observed in other European countries. In Sweden, the proportion of young males reporting for military fitness examinations who were overweight or obese increased from 14% in 1974 to 23% in 1990.16 In Austria, the proportion of young males with a BMI over 25 increased from 12.9 to 15.5% from 1986 to 2005, whereas the proportion with a BMI over 35 increased from 2.5 to 5.8%.17 In Hungary, the proportion of young males with a BMI over 25 increased from 9% in 1973 to 16% 1998.18

Obesity is also occurring earlier and earlier during childhood development. Children currently have a higher body mass than their peers from 10 to 20 years ago.19,20 The epidemic of childhood obesity is spreading at an alarming rate.2 In European countries, the proportion of children who were overweight or obese increased by about 0.1% a year in the 1970s, by 0.4% a year in the 1980s, and by 0.8% a year in the 1990s. Since 2000, it has been increasing by 2% a year in Spain.

Excess weight is a widely recognized factor in the development of many disorders.21,22 The longer an individual has been overweight, the greater the risk of developing complications due to obesity during adulthood.23–25 Obesity during childhood and adolescence can in itself increase morbidity and premature mortality during adulthood.26 Longitudinal studies have shown that there is a strong correlation between BMI during childhood and BMI during adulthood.27 In the Wroclaw Growth Study, the correlation coefficient between BMI at 18 and BMI at 50 was 0.64, with the mean BMI increasing from 21.0 at 18 to 26.6 at 50.28 From 26 to 41% of individuals who had been obese during their preschool years were also obese during adulthood. From 42 to 63% of those who were obese during primary school were obese during adulthood.29 Furthermore, in all of the studies cited by Serdula et al.,29 the risk of an individual being obese was at least twice as high in all adult age groups if the individual had been obese as a child.

It can be expected that the proportion of overweight and obese children and adolescents in Poland will continue to increase, and that these young people have an increased risk of developing severe health complications such as type II diabetes, certain neoplasms, osteoarthritis, metabolic disorders and disorders of the circulatory and musculoskeletal systems. These disorders are beginning to arise at an ever earlier age, increasing the proportion of individuals in the population who are unfit for work and require costly medical care. The most dramatic effect may well be the reversal of the trend toward a longer average lifespan. In the Framingham Heart Study in the United States, obesity at age 40 reduces life expectancy by 6 years in men and by 7 years in women.30 In individuals with a BMI between 30 and 35, median survival is reduced by 2–4 years, and by 8–10 years in individuals with a BMI of 40–45, which is comparable with the effect of smoking.22

The alarming trend toward increasing obesity described in this article and the tempo at which it is spreading among young Poles present not only a danger to public health but also to society and the economy as a whole. In Poland, the epidemic of obesity has reached almost the same level in 20 years as that observed in countries in which the epidemic started much earlier. For public health services, it is a major challenge not only to deal with the epidemic as it stands now, but also to predict and prevent its long-term effects. It is, therefore, vital to constantly monitor the spread of obesity in every age group.

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Key points

- Obesity has become one of the most serious health problems in almost all countries, both industrialized and developing.
- In Poland, the epidemic of obesity has reached almost the same level in 20 years as that observed in countries in which the epidemic started much earlier.
- The changes in BMI observed over the last 45 years in Poland clearly show that diometric changes in lifestyle took place after economic transformation.
- It can be expected that the proportion of overweight and obese children and adolescents in Poland will continue to increase, and that these young people have an increased risk of developing severe health complications.

References


