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The Association between Body Weight During Late Adolescence and Direct Medical Costs Further in Life

Melzer Cohen Cheli [1,2], Chodick Gabriel [2, 3], Twig Gilad [3,4,5,6], Leshno Moshe[1,3]

1- Faculty of Management, Tel-Aviv University, Tel -Aviv, Israel ; 2- Maccabi Institute for Research and Innovation, Maccabi Healthcare Services, Tel-Aviv, Israel; 3- Faculty of Medicine, Tel-Aviv University, Tel-Aviv, Israel;
4- Gertner Institute for Epidemiology and Health Policy Research, Sheba Medical Center, Ramat Gan, Israel; 5- The Israel Defense Forces Medical Corps, Ramat Gan, Israel;
6- Institute of Endocrinology, Sheba Medical Center, Ramat Gan, Israel

Introduction

The global prevalence of overweight and obesity among children and adolescents have been soaring during the last decades[1]. Little evidences exist on the association between adolescents with overweight and obesity and medical expenditures further in life.

Objective

To evaluate the association between adolescent body mass index (BMI) and medical expenditures at ages 35, 45 and 55.

Methods

- In this retrospective cohort study, we used data of a large state-mandated health provider in Israel (Maccabi Healthcare Services, MHS) and from the Israeli Defense Forces (IDF).
- We identified MHS members, born since 1950 with a BMI measurement in late adolescence taken as part of mandatory physical examination at age ~17 during pre-recruitment to the IDF.
- The cohort's yearly (full calendar year) medical expenditures were evaluated during 2010-2021, at the ages of 35, 45 or 55 years.
- BMI categories were defined as underweight (<18.5 kg/m^2), normal weight (18.5-<25 kg/m^2; reference), overweight (25-<30 kg/m^2), obesity class I (30-<35 kg/m^2) and class II+III (35+ kg/m^2).
- Residential socioeconomic status score (ranked 1 (lowest) to 10 (highest)) was derived from the Israeli Central Bureau of Statistics is a score.
- Generalized linear model with gamma distribution with log link was used to estimate the association between BMI categories and medical expenditures.

Results

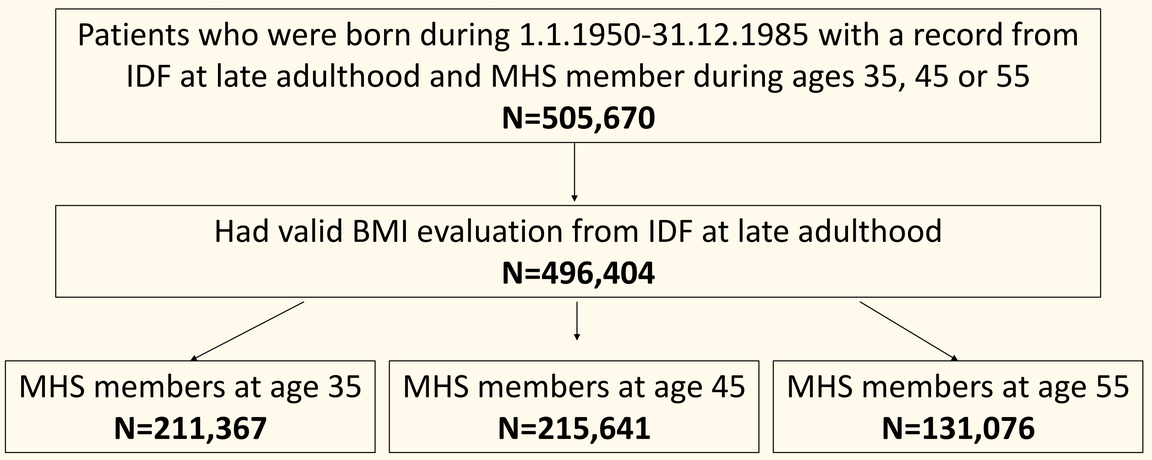
- Overall, 496,404 patients who met the inclusion criteria (268,790 (54.1%) were males) were identified (Figure 1).
- At mean (SD) age of 17.4 (0.47), 14.1% of adolescents were with underweight, 74.4% normal weight, 9.5% overweight, 2% were with obesity (Figure 2).
- At age of 45, median (Q1-Q3) medical expenditures for people with normal weight was 468.5 (208.0-993.2) I$ and among patients with obesity class I was 678.0 (284.9-1624.2) I$ (Figure 3).
- This difference is expressed by rate ratio [RR]: 1.65 (95%CI 1.58-1.72; Figure 4).
- Similar trends were observed at age of 35 and 55 and after stratification by sex and socioeconomic.

Methods cont.

Calculation of total direct medical expenditures

- Total direct medical expenditure includes all actual medical expenditures captured in MHS (including primary and secondary care visits, laboratory examinations, procedures, medications, hospitalizations).
- Patients may be included in more than one age of medical expenditure.
- To control change in costs over time, medical costs were converted using Gross Domestic Product (GDP) [2,3].
- To generalize this study to other countries, medical expenditures were converted to international dollars (I$) in each year, using purchasing power parity (PPP) exchange rate[4].
- Top 1% of medical expenditures were truncated to the 99% highest medical costs.

Figure 1:Flow diagram of included patients:



Women with indication of pregnancy 9 months before and after the year of medical expenditure evaluation were removed from analysis.
Abbreviations: IDF, Israeli Defense Forces; MHS, Maccabi Healthcare Services; BMI, Body mass index

Figure 2: Pie diagrams of BMI categories

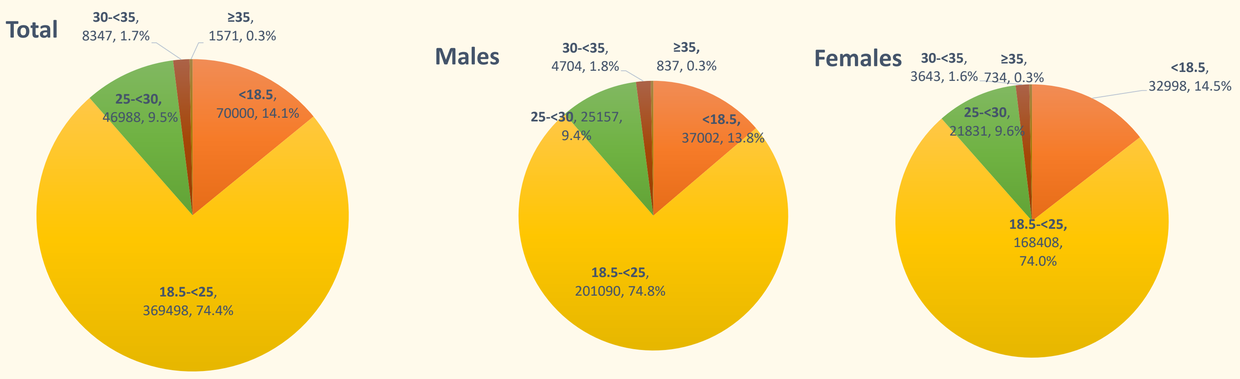
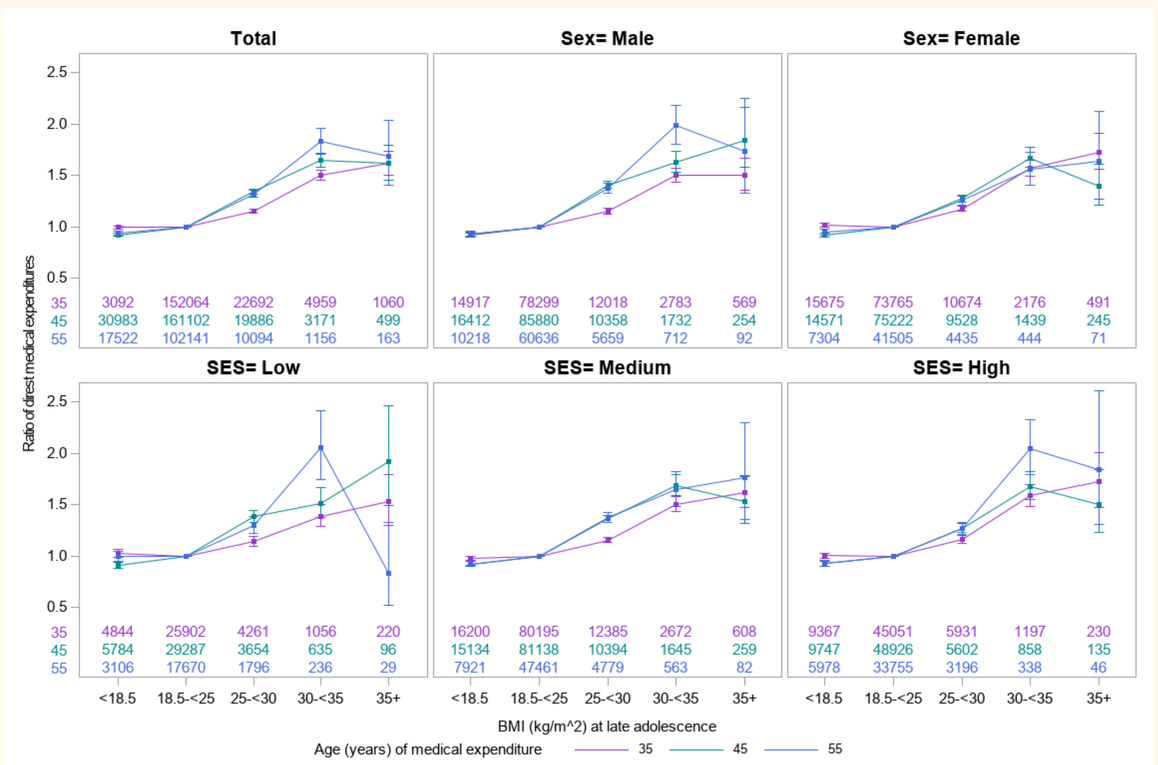
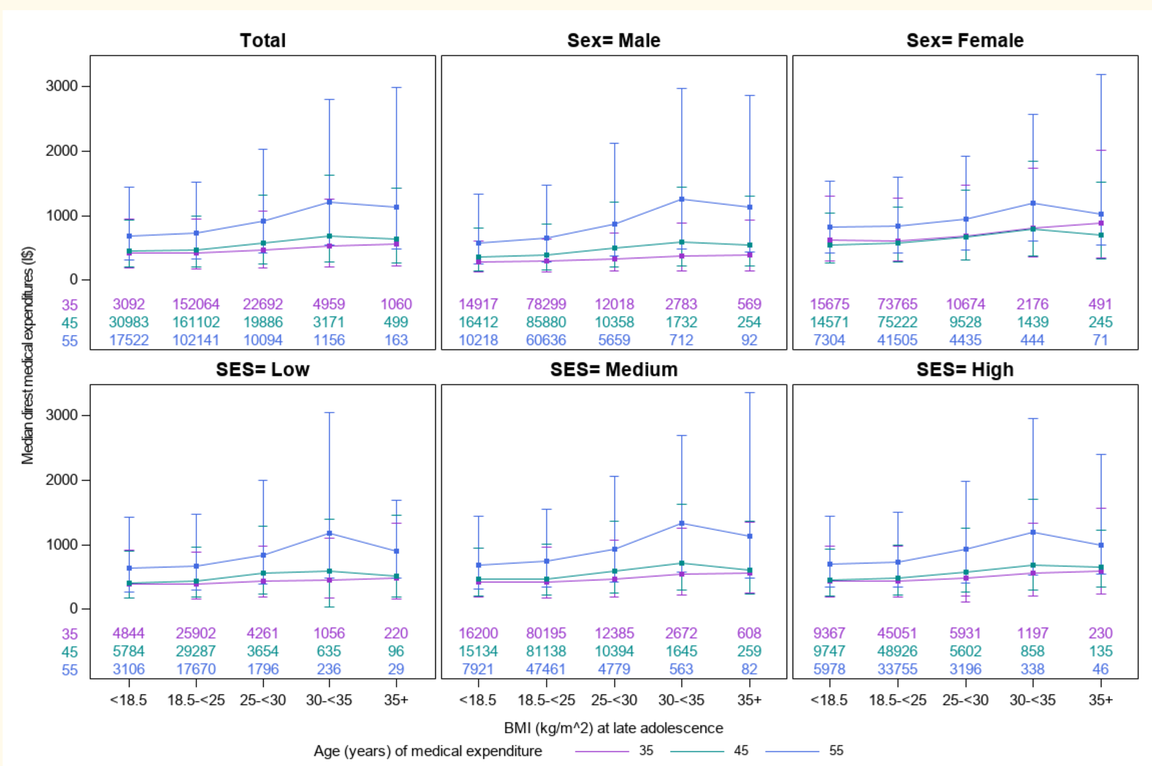


Figure 3: Ratio (95% CI) of total medical expenditures of BMI categories compared to reference group (normal BMI: 18.5-<25 kg/m^2) at late adulthood, stratified by sex and socioeconomic status



Numbers below graphs represents number of patients included in each year of medical cost and BMI category.
Medical expenditure's ration was calculated by using generalized linear model with gamma distribution with log link was used to estimate the association between BMI categories and medical expenditures.
Abbreviations: BMI, Body mass index; SES, socioeconomic status.

Figure 4: Median (Q1-Q3) of total direct medical costs by BMI categories at late adulthood, stratified by sex and Socioeconomic status



Numbers below graphs represents number of patients included in each year of medical cost and BMI category.
Abbreviations: BMI, Body mass index; SES, socioeconomic status; I$, international dollars.

References

[1] Ogden, Cynthia L., et al. "Trends in obesity prevalence among children and adolescents in the United States, 1988-1994 through 2013-2014." JAMA 315.21 (2016): 2292-2299.
[2] Turner, Hugo C., et al. "Adjusting for inflation and currency changes within health economic studies." Value in Health 22.9 (2019): 1026-1032.
[3] https://www.macrotrends.net/countries/ISR/israel/inflation-rate-cpi
[4] https://data.oecd.org/conversion/purchasing-power-parities-ppp.htm

Conclusion

Overweight and especially obesity in late adolescence are associated with increased medical expenditures during adulthood, even at age 35. This association was observed overall and after stratification by sex and socioeconomic status. Nevertheless, weight loss therapies are mainly approved for higher levels of obesity.