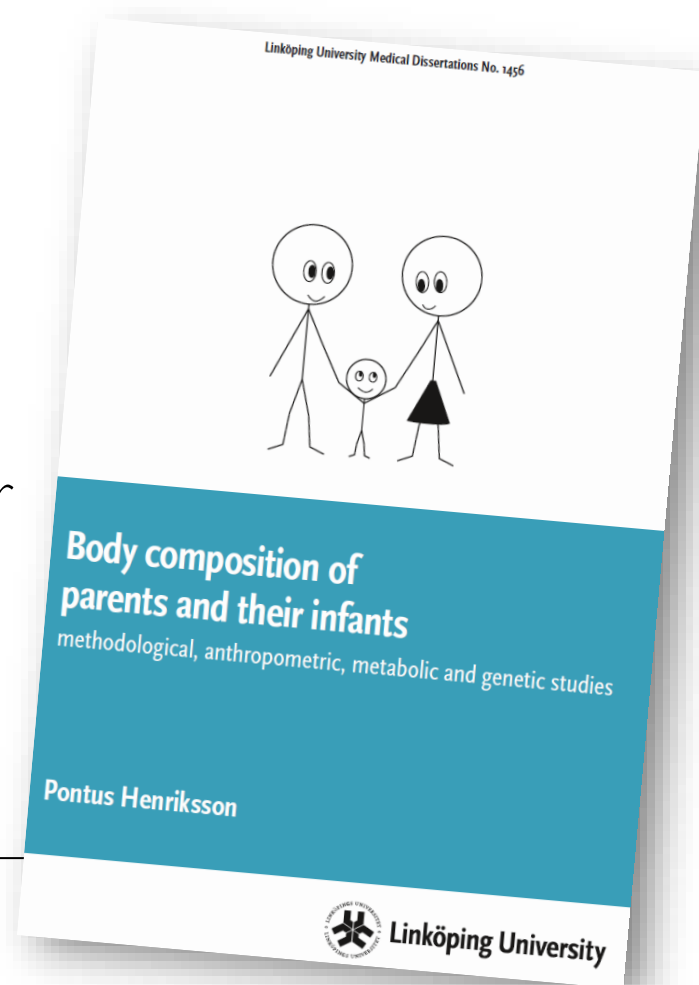


Vad är det som påverkar barns hälsotillstånd och utveckling av obesitas?

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4 huvudsakliga forskningsintressen

- Determinanter för obesitas och kardiovaskulär hälsa hos barn och vuxna
- Påverkan av nutrition, kroppssammansättning/obesitas fetma och fysisk aktivitet på hälsoutfall hos barn och vuxna
- Effekt av mhälsa (digitala) interventioner på hälsobeteenden
- Ojämlighet i hälsa mellan utlandsfödda och svenskfödda personer

Dagens presentation

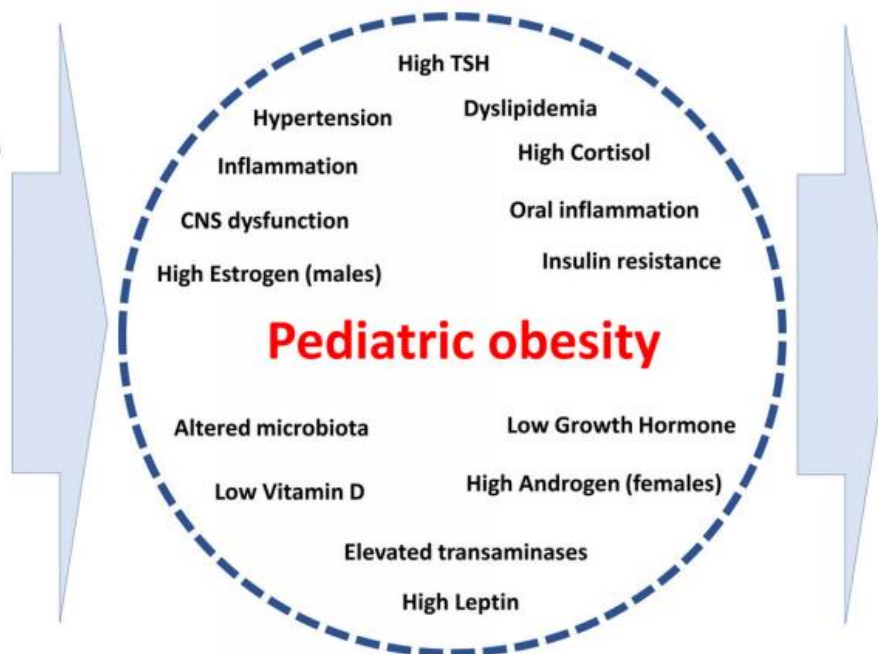
- 1. Determinanter för obesitas hos barn
- 2. Obesitas hos barn och hälsoutfall
- 3. Kan god fysisk kondition minska de negativa konsekvenserna av obesitas?

Determinanter av obesitas hos barn

Risk factors

- Genetics
- Epigenetics
- Obesogenetic environment
 - 24/7- food availability, affordability of energy-dense foods
 - Sedentary activities
 - Limited access to recreation areas
- Unhealthy eating habits
 - Large portion sizes
 - High intake of sugar-sweetened beverages
 - High glycemic foods
 - High intake of fast foods
 - Low fiber content
 - Low intake of fruits and vegetables
 - Irregular food intake
- Lifestyle factors
 - Low physical activity
 - Sedentary lifestyle
 - Insufficient sleep
 - Stress and depression

Mechanisms



Long-term consequences

- Type 2 diabetes
- Type 1 diabetes
- Cardiovascular disease
- Nonalcoholic fatty liver disease
- Cognition defects
- Multiple sclerosis
- Periodontitis and Caries
- Cancer – malignancies
- Mb Crohn
- PCO syndrome
- Gynecomastia
- Premature mortality
- Pseudotumor Cerebri
- Asthma
- Arthritis

Fig. 2 Many different factors contribute to the long-term effects of childhood obesity. They interact in a complex pattern and it is difficult to identify one specific mechanism responsible for one long-term consequence. The low-intensity inflammation caused by obesity in young children already contributes to many obesity-associated diseases.

Vad orsakar obesitas hos barn?

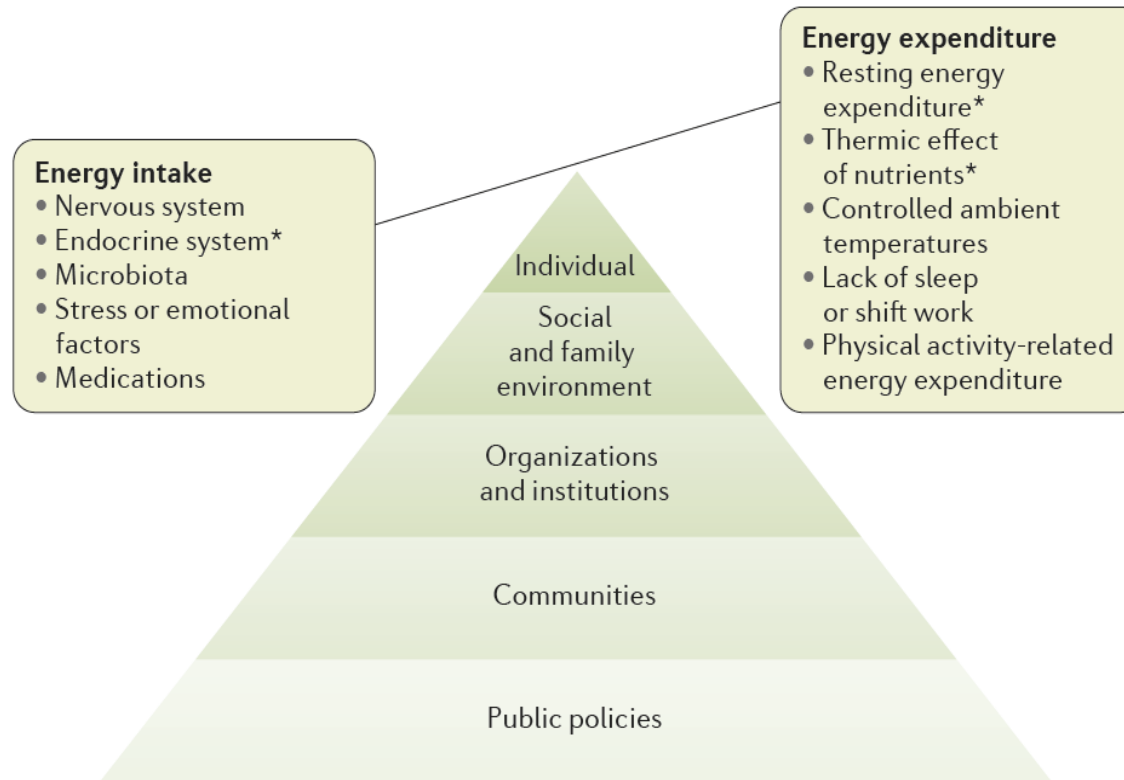


Figure 4 | **Key factors involved in the regulation of energy balance.** The energy balance is influenced by several biological factors. Although this balance indirectly relates to the first thermodynamic law, it cannot be translated to the level of causality. The pyramid holding the balance emphasizes the notion that we need to go beyond individual factors to ultimately have an optimal effect on the energy balance equation.
*Could be affected by genetic and epigenetic factors.

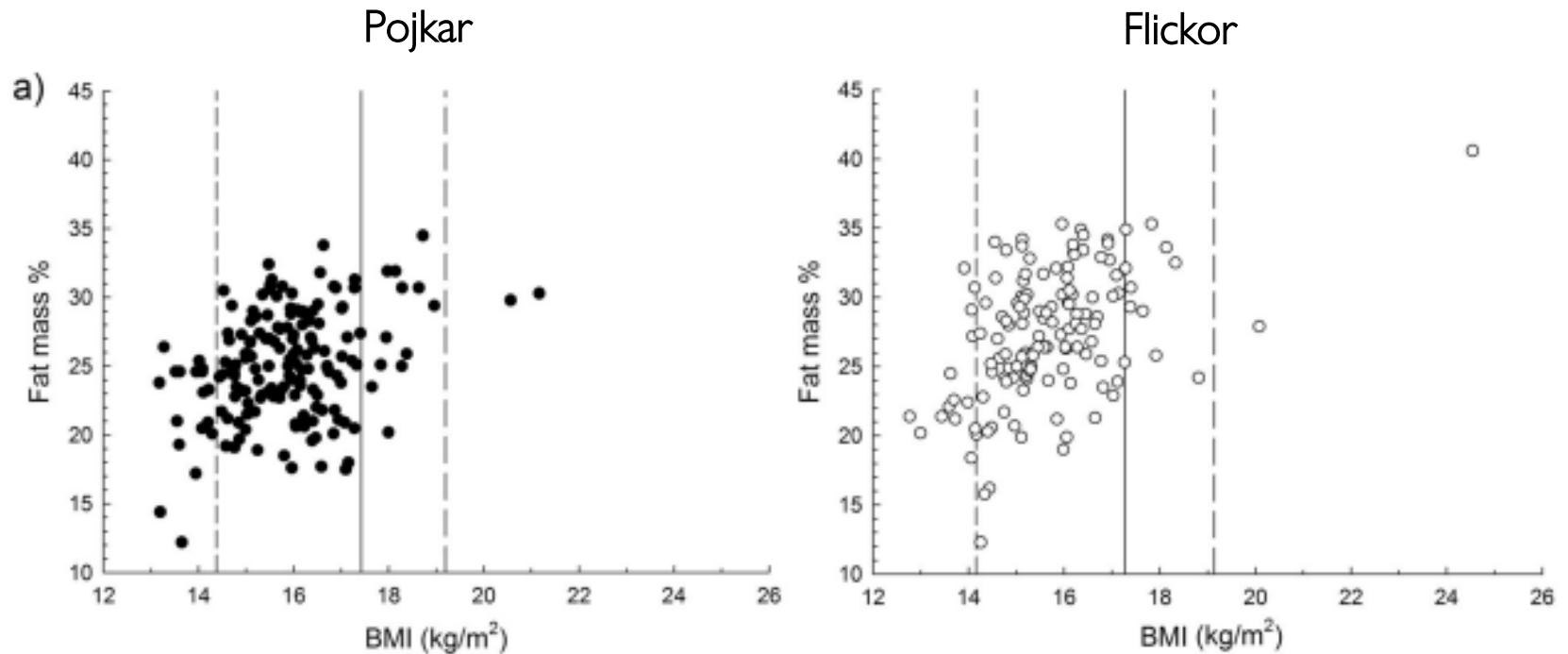
Bakgrund till studie

- Det är välkänt att obesitas har en stark genetisk komponent
- Body mass index är inte ett bra mått på kroppssammansättning (fettmassa och fettfri massa)
- Sambandet mellan föräldrar och barns kroppssammansättning är till stor del okänt
- Därför studerade vi samband mellan föräldrar och barns kroppssammansättning (vid 1 och 12 veckor samt 4 och 9 års ålder)



BMI och %kroppsfett hos barn

(Delisle Nyström C, Henriksson P, et al. Eur J Clin Nutr. 2018;72:1561-1566)



Tidigare studier – följt upp barnen vid 1 veckas ålder

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REGULAR ARTICLE

Parental fat-free mass is related to the fat-free mass of infants and maternal fat mass is related to the fat mass of infant girls

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Keywords

Body composition, Father, Infant, Mother, Sex difference

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ABSTRACT

Aim: Existing studies suggest that weight and body composition of parents influence the size and body composition of their offspring, but are often inconclusive and conducted by means of inappropriate body composition methodology. Our aim was to study infant size and body composition variables in relation to body composition variables of their mothers and fathers in a well-nourished population using an accurate methodology.

Methods: Between 2008 and 2011, we used air displacement plethysmography to measure the body composition of 209 parent–infant units. Parents were measured when women were in gestational week 32. Their healthy, singleton, full-term infants were measured at 1 week.

Results: Infant fat-free mass in grams was positively related ($p \leq 0.007$) to the fat-free mass in kilograms of the mothers (15.6 g/kg) and the fathers (9.1 g/kg). Furthermore, the fat mass of the daughters, but not of the sons, was positively related to the fat mass of the mothers (5.8 g/kg, $p = 0.007$).

Conclusion: This study found associations between the fat-free mass of parents and infants and an association between the fat mass of mothers and their infant girls. These findings may help to understand early life factors behind overweight and obesity.

Article

Glucose Homeostasis Variables in Pregnancy *versus* Maternal and Infant Body Composition

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Abstract: Intrauterine factors influence infant size and body composition but the mechanisms involved are to a large extent unknown. We studied relationships between the body composition of pregnant women and variables related to their glucose homeostasis, *i.e.*, glucose, HOMA-IR (homeostasis model assessment-insulin resistance), hemoglobin A_{1c} and IGFBP-1 (insulin-like growth factor binding protein-1), and related these variables to the body composition of their infants. Body composition of 209 women in gestational week 32 and of their healthy, singleton and full-term one-week-old infants was measured using air displacement plethysmography. Glucose homeostasis variables were assessed in gestational week 32. HOMA-IR was positively related to fat mass index and fat mass ($r^2 = 0.32$, $p < 0.001$) of the women. Maternal glucose and HOMA-IR values were positively ($p \leq 0.006$) associated, while IGFBP-1 was negatively ($p = 0.001$) associated, with infant fat mass. HOMA-IR was positively associated with fat mass of daughters ($p < 0.001$), but not of sons ($p = 0.65$) (Sex-interaction: $p = 0.042$). In conclusion, glucose homeostasis variables of pregnant women are related to their own body composition and to that of their infants. The results suggest that a previously identified relationship between fat mass of mothers and daughters is mediated by maternal insulin resistance.

Longitudinal associations of parental body composition with body composition and cardiovascular risk factors in their children:

Prospective cohort study

Pontus Henriksson¹, Johanna Sandborg^{1,2}, Jairo Hidalgo Migueles^{2,3}, Francisco B Ortega^{3,2,4},
Marie Löf^{1,2}

Samband mellan föräldrar och barns kroppssammansättning

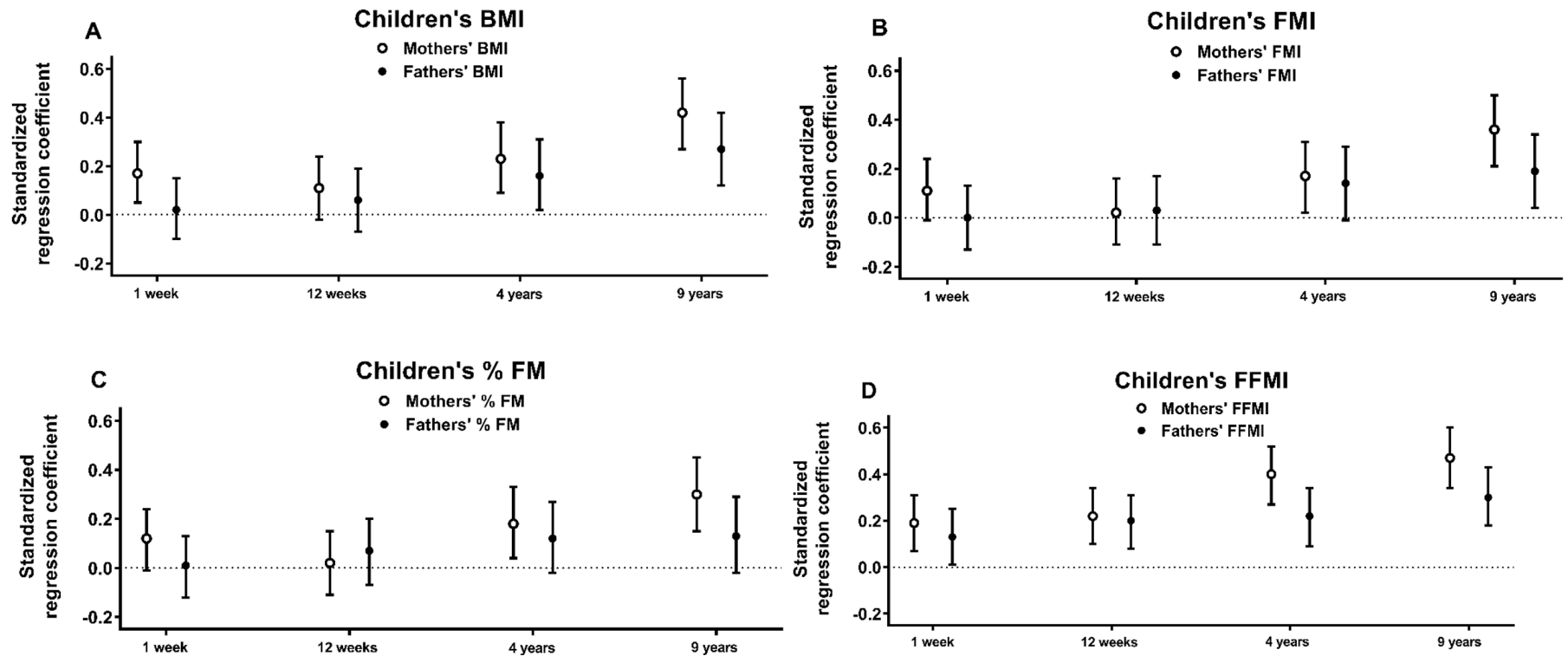


Figure 1. Adjusted longitudinal associations of parental body composition variables with corresponding body composition variables of their children during infancy and childhood. A) body mass index (BMI); B) fat mass index (FMI); C) percent fat mass (% FM); D) fat-free mass index (FFMI). Associations were adjusted for child's sex, gestational age at birth and age at the measurements, maternal parity, maternal educational attainment and the corresponding body composition variable for the other parent.

Eventuell könsskillnad där mammans fettmassa har starkare samband med fettmassa hos flickor

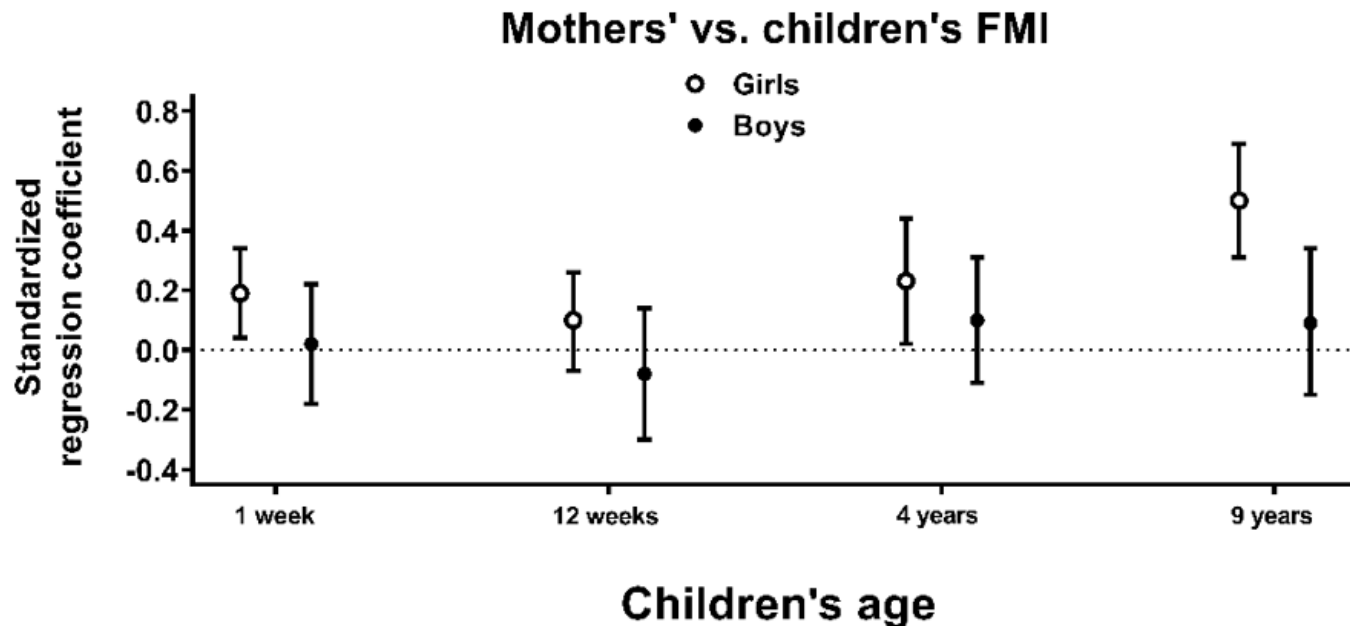


Figure 2. Adjusted longitudinal associations of mother's fat mass index (FMI) with the fat mass index of their daughters and sons during infancy and childhood. Associations were adjusted for child's sex, gestational age at birth and age at the measurements, maternal parity, maternal educational and father's fat mass index.

Sammanfattning av huvudfynd

- Tydliga samband mellan föräldrars och barns kroppssammansättning som blir starkare under barndomen
- Mammans fettmassa var associerad med fettmassa hos döttrar men inte pojkar (och detta identifierades inte med BMI)
- Samband med mamman verkar starkare än motsvarande samband för pappan
- Föräldrars kroppssammansättning under graviditet säger oss något om kroppssammansättning hos deras barn nästan 10 år senare

Obesitas hos barn och hälsoutfall

Conditions caused or worsened in children with obesity: all organ systems are affected

Psychosocial – stigmatization

Depression
Anxiety
Poor self-esteem
Social isolation
Eating disorder
Reduced cardio-respiratory fitness
Lower educational attainment

Endocrine and metabolic disturbances

Insulin resistance
Type 2 diabetes
Dyslipidemia
Thyroid dysfunction
Early puberty
Polycystic ovary syndrome
Hypogonadism (boys)
Gynecomastia (boys)

Cardiovascular co-morbidities

Hypertension
Left ventricular hypertrophy
Endothelial dysfunction
Reduced cardio-respiratory

Pulmonary complications

Obstructive sleep apnea
Asthma



Cancer

Acute lymphatic leucemia

Neurological alterations

Pseudotumor cerebri
Cognitive dysfunction
Reduced eye health
Hearing loss

Impaired oral health

Orofacial growth alteration
Caries
Periodontitis

Immunologic and autoimmune diseases

Chronic low-intensity inflammation
Arthritis
Diabetes type I
Multiple sclerosis
Psoriasis

Renal disturbances

Glomerulosclerosis
Hyperfiltration

Gastrointestinal and nutrition complications

Nonalcoholic fatty liver disease (NAFLD)
Gallstones
GERD (Acid reflux disease)
Vitamin D insufficiency
Iron deficiency

Musculoskeletal disturbances

Abnormal bone content
Altered growth pattern
Slipped capital femoral epiphysis
Blount's disease
Flat feet
Fractures

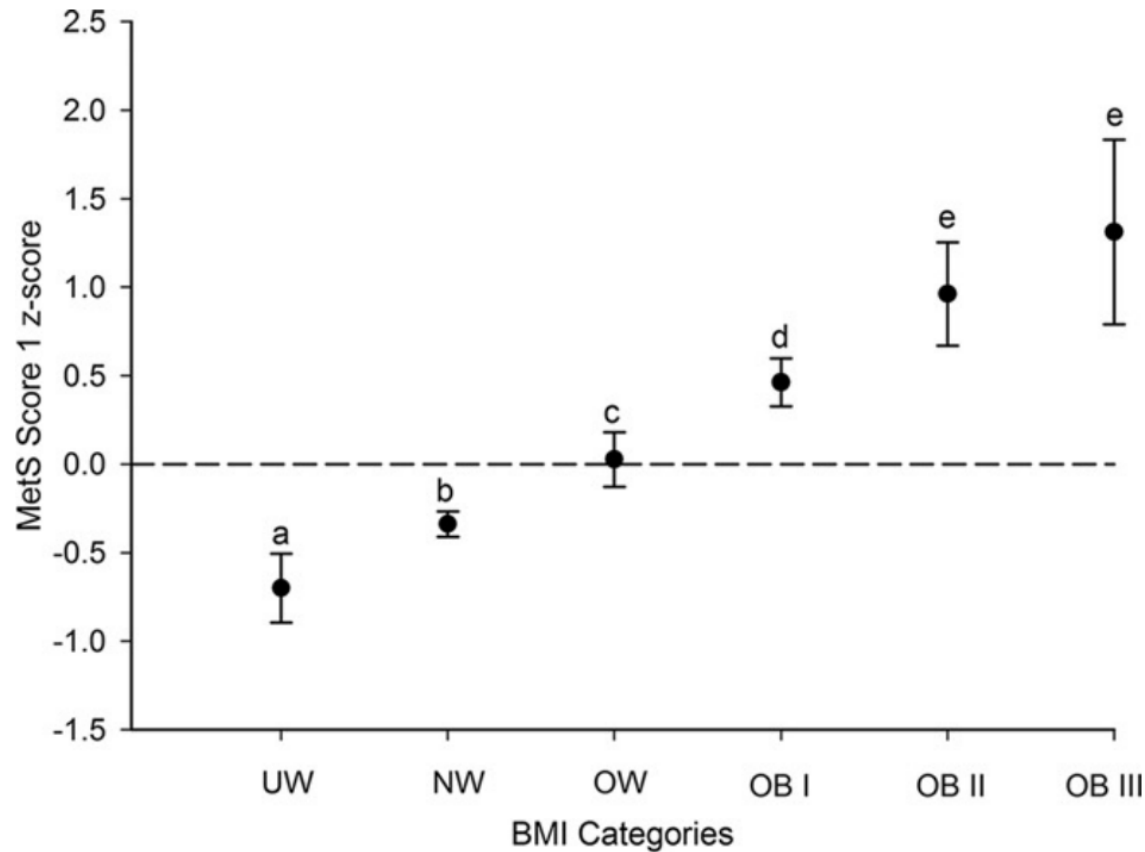
Dermatologic complications

Acanthosis Nigricans
Stretch marks
Intertrigo

Fig. 1 Diseases and conditions caused or aggravated by obesity during childhood and adolescence. Childhood obesity is a systemic disease and almost all organs in the body are potentially affected.

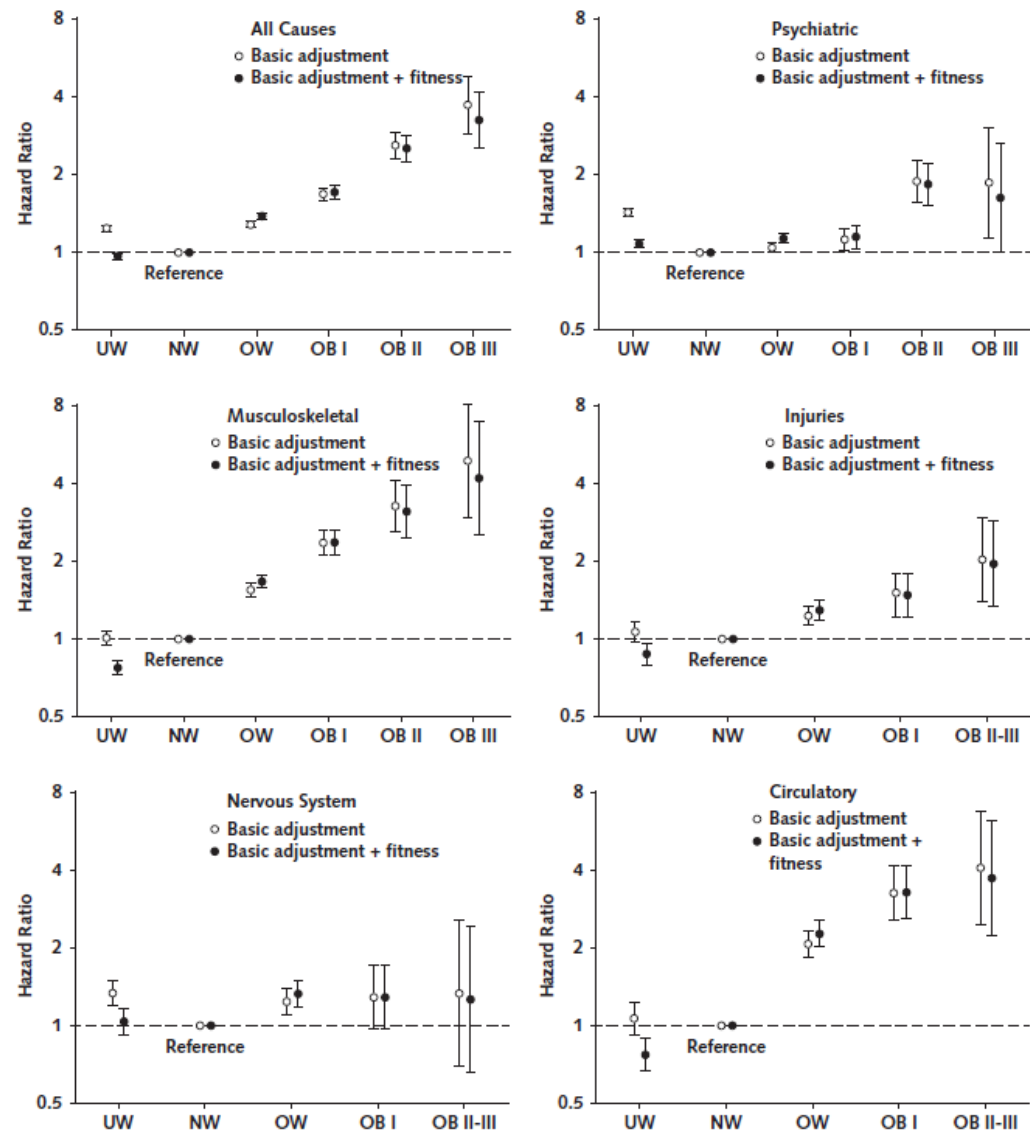
Barn med obesitas har fler riskfaktorer för hjärtskärlsjukdom redan i 8-12 års åldern

(Nyström CD, Henriksson P et al. Diabetes Care 2017;40:1580-1587)



Obesitas i ungdom och sjukersättning senare i livet

Figure 3. Association of BMI with later receipt of a disability pension due to all and specific causes ($n = 1\,079\,128$).



Henriksson P et al.
Ann Intern Med.
2019;170:230-239.

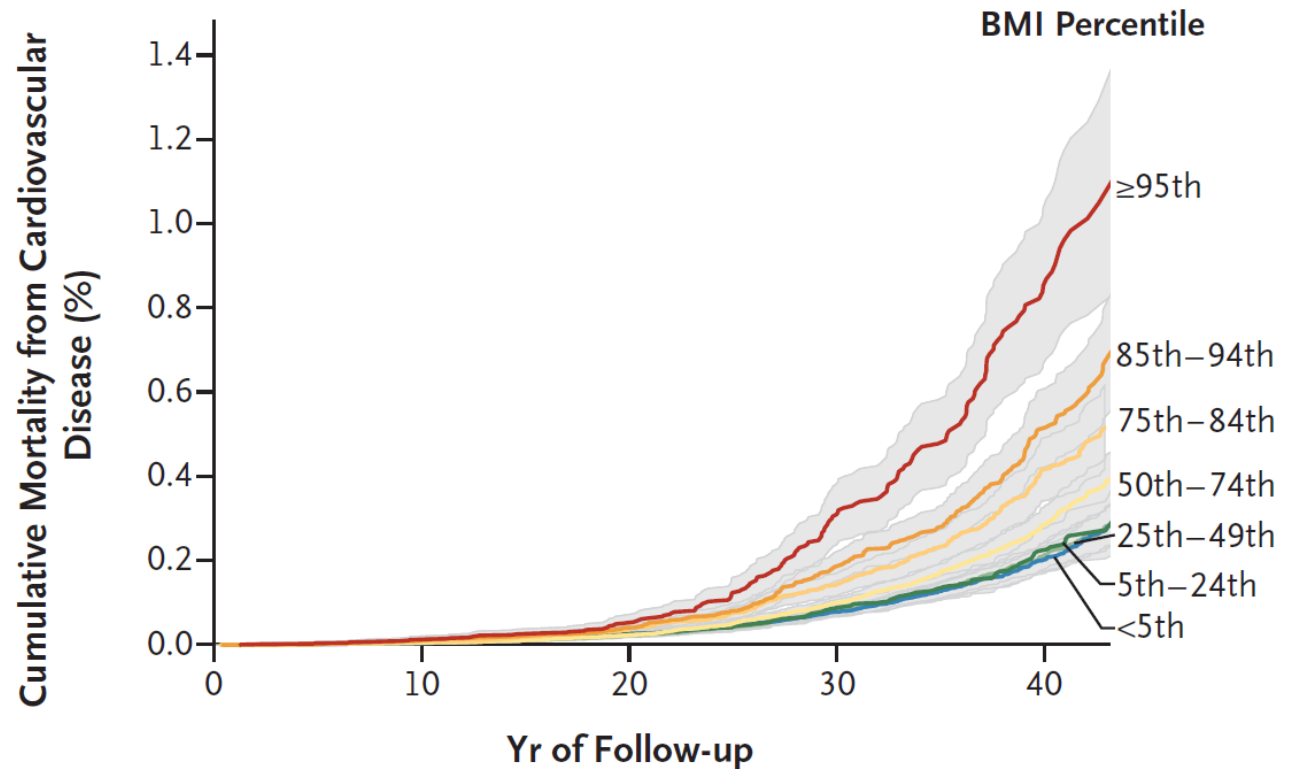
BMI i tonåren och kardiovaskulär dödlighet

BMI för 95:e
percentil

pojkar: 28.4 kg/m²

Flickor: 29.8 kg/m²

Twig G et al. Body-Mass Index in 2.3 Million Adolescents and Cardiovascular Death in Adulthood. N Engl J Med. 2016;374:2430-40.



No. at Risk

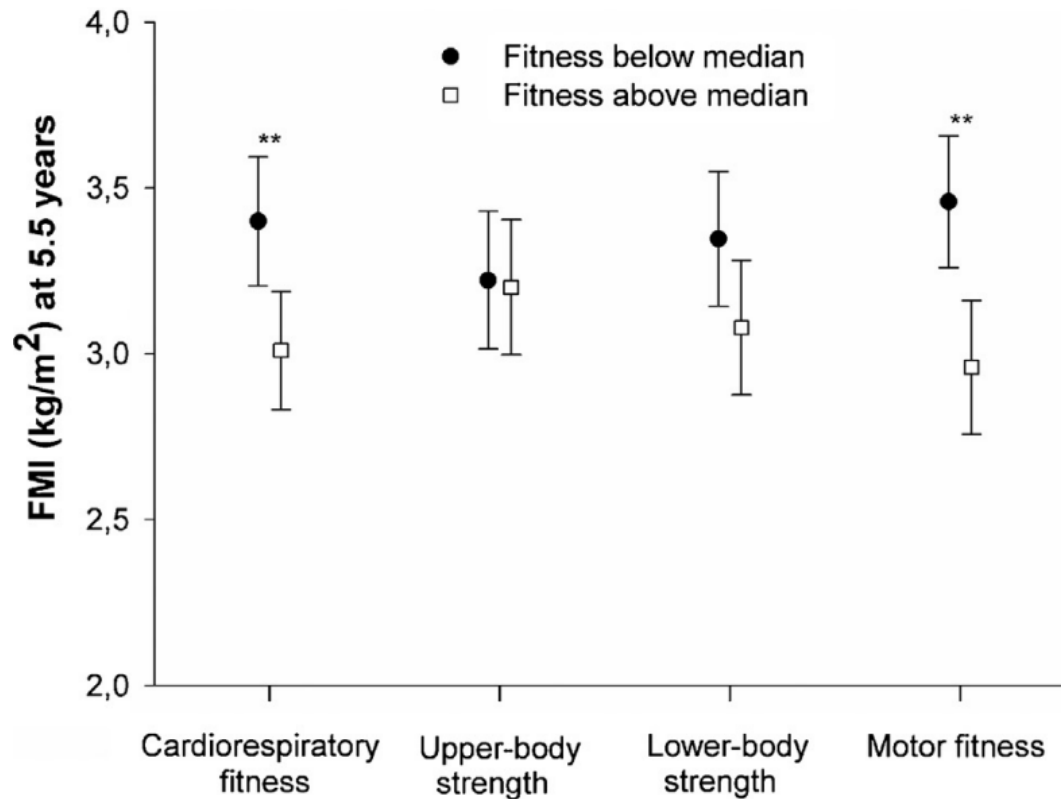
Participants at risk	1,712,018	1,042,018	540,636	160,145
Cumulative person-yr	17,201,301	30,718,320	38,472,521	41,926,636
Cumulative cardiovascular deaths	185	609	1,577	2,676

Figure 2. Body-Mass Index (BMI) during Adolescence and Subsequent Cardiovascular Mortality.

Kan god fysisk kondition minska de negativa konsekvenserna av obesitas?

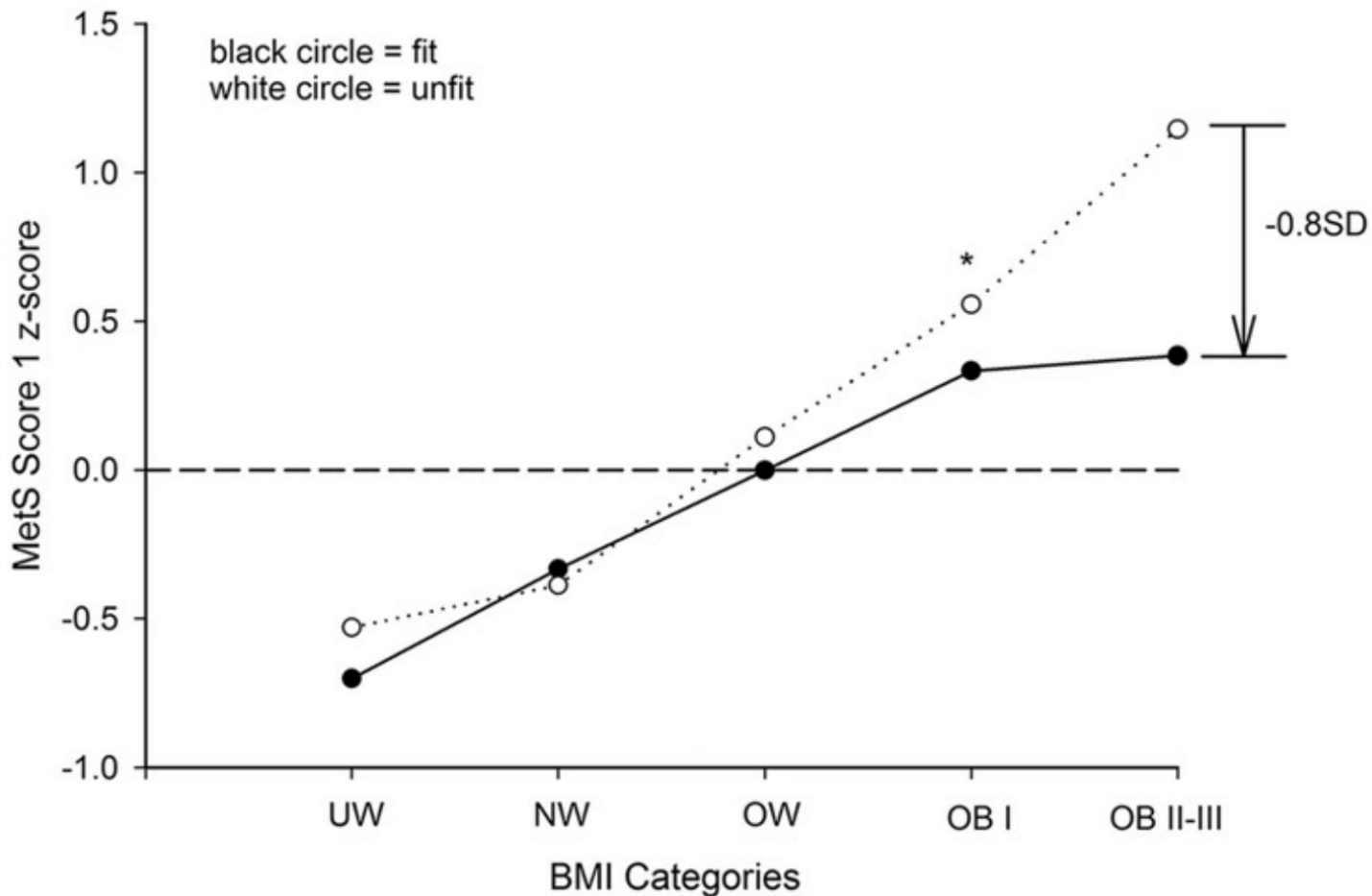
Barn som har bättre kondition och muskelstyrka vid 4 års ålder har lägre fettmassa 1 år senare

(Henriksson P, et al. J Sci Med Sport. 2019;22:574-579.)



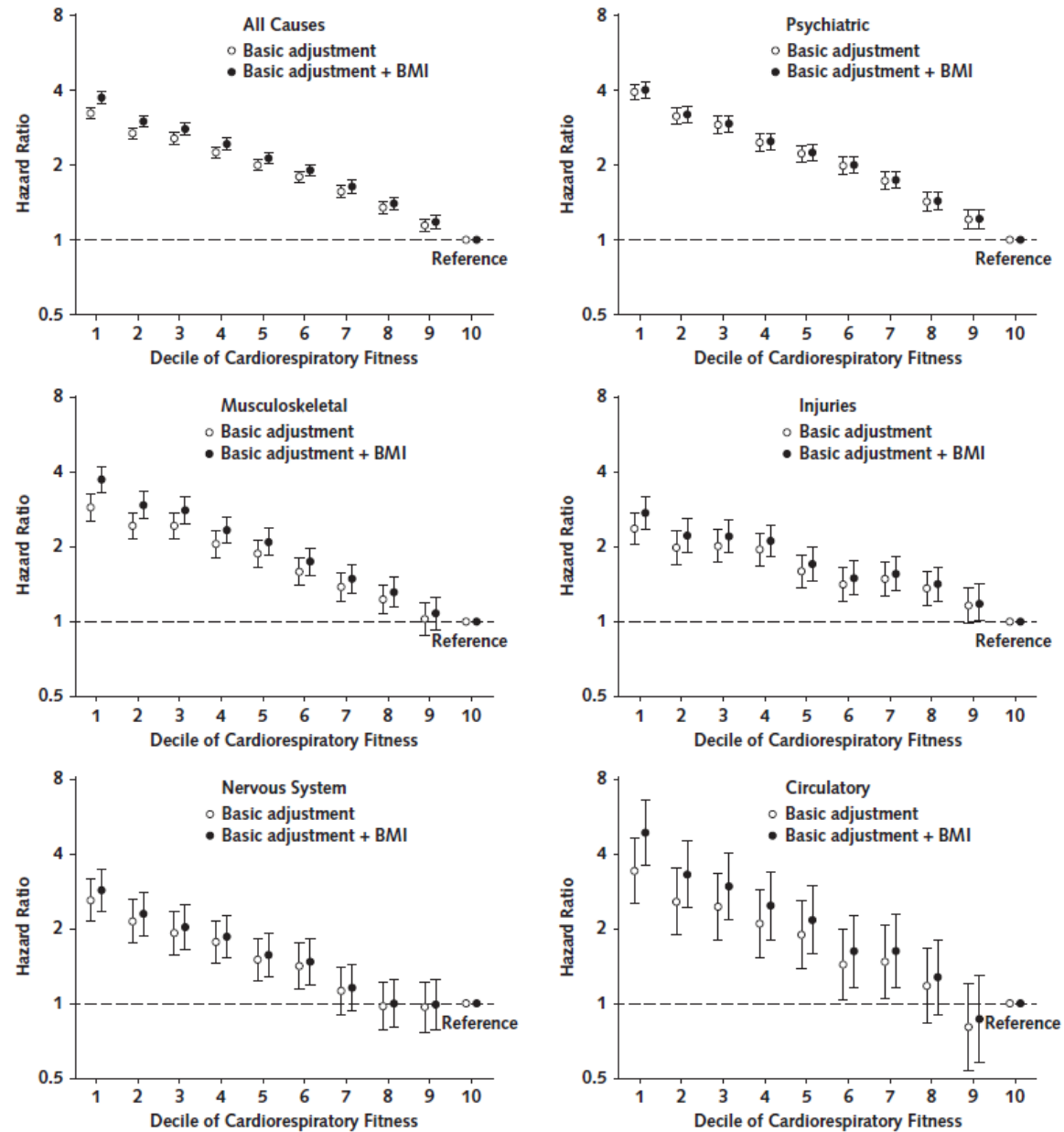
Barn med obesitas som har god kondition har längre kardiovaskulär risk än de med sämre kondition

(Nyström CD, Henriksson P et al. Diabetes Care 2017;40:1580-1587)



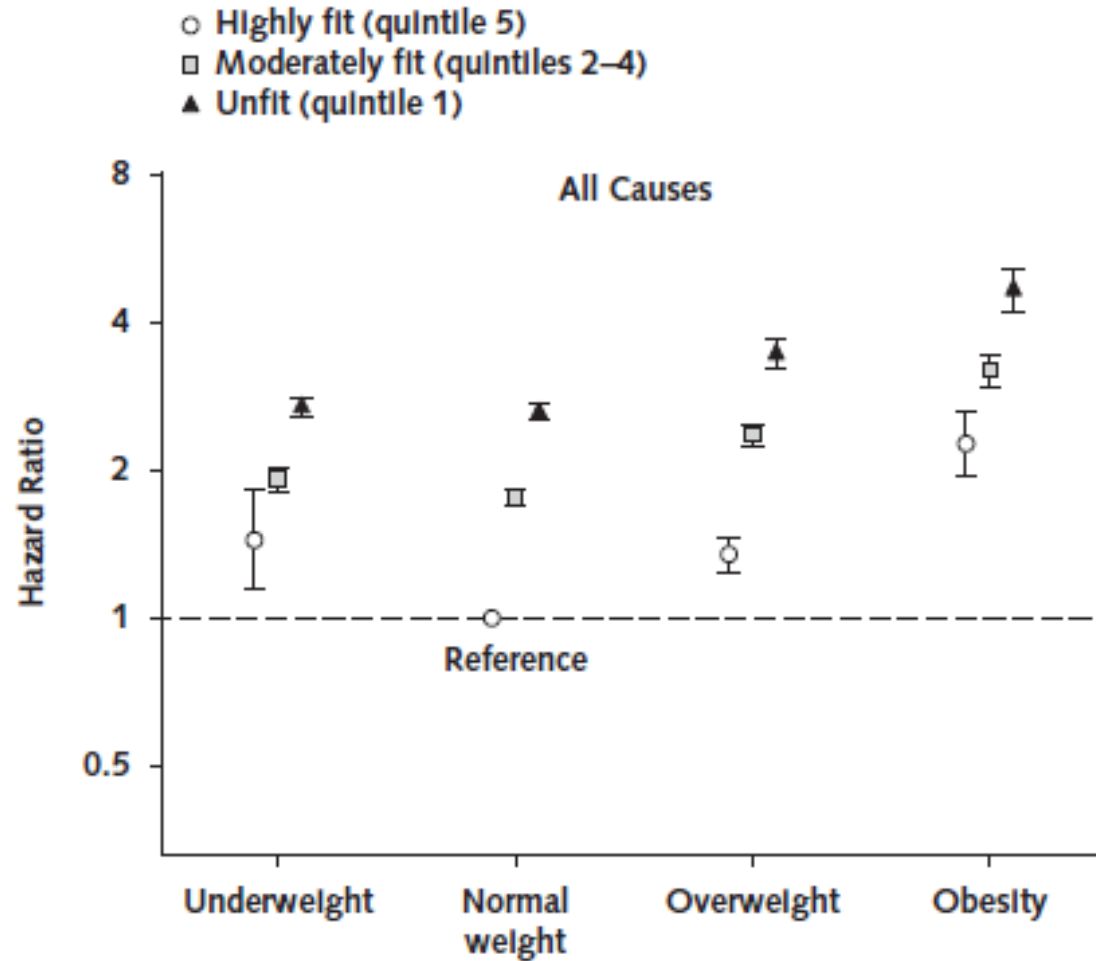
Kondition i ungdom och sjukersättning senare i livet

Figure 2. Association of cardiorespiratory fitness with later receipt of a disability pension due to all and specific causes ($n = 1\,079\,128$).



Henriksson P et
Ann Intern Med
2019;170:230-2

Ungdomar med obesitas som har god kondition har längre risk för senare sjukpenning än de med sämre kondition



Tack

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Tack!
Frågor?