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Trends in overweight and obesity in relation to weight change attempts in young adulthood: cross-sectional and repeated measurements from a population-based health study, the Fit Futures study

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Abstract

Background: Young adulthood is a key period for the development of overweight and obesity; however, less is known about changes in BMI and weight-related behaviors across this life stage. The aim of this study was therefore to examine sex-specific patterns of body mass index (BMI), overweight, obesity, and weight-change attempts at ages 18 and 27 years, and whether weight-change attempts at age 18 were associated with subsequent BMI change.

Methods: We used data from the Fit Futures study, a population-based cohort study conducted in Northern Norway. Cross-sectional analyses included 775 participants aged 17–20 years at Fit Futures 2 (2012–2013) and 654 participants aged 26–29 years at Fit Futures 3 (2021–2022). Repeated measurement analyses included 524 participants with valid BMI measurements at both time points. Height and weight were measured using standardized procedures. Weight-change attempts were self-reported. Analyses were stratified by sex, and linear regression was used to examine whether weight-change attempts at age 18 were associated with subsequent BMI change.

Results: In repeated measurement analyses, mean BMI increased significantly between ages 18 and 27 in both females and males, from 23.12 to 25.55 kg/m² and from 23.40 to 26.00 kg/m², respectively. The combined prevalence of overweight and obesity approximately doubled in both sexes between ages 18 and 27. The prevalence of obesity alone increased from 7.5% to 19.3% and from 8.1% to 16.7% in females and males, respectively. Among participants with overweight at age 18, 52% of females and 30% of males had progressed to obesity by age 27. Weight-loss attempts were common among females at both ages and increased markedly among males, from 24.8% at age 18 to 38.5% at age 27. Weight-change attempts at age 18 were not significantly associated with subsequent BMI change in either sex.

Conclusions: Although weight-loss attempts were common and persistent, BMI and the prevalence of overweight and obesity increased substantially from late adolescence to young adulthood, with a particularly marked increase in obesity. These findings support the need for population-level obesity prevention strategies that extend beyond individual behavior change.

Background

Overweight and obesity represent major concerns for public health and have adverse consequences for morbidity and mortality (1). Over half of the world's population is classified with excess weight and the prevalence of global obesity is expected to rise (2).

The World Health Organization (1) describes obesity as a chronic complex disease. In line with this, the Lancet Commission emphasizes that obesity should be understood as a multifactorial condition with causes that are not yet fully understood, involving genetic, environmental, psychological, nutritional, and metabolic factors that may alter the biological mechanisms regulating adipose tissue (3). Obesity has been described by Egger and Swinburn (4) as a "normal response to an abnormal environment". This perspective is reflected in the concept of obesogenic environments, where social, physical, economic, and political conditions shape food and physical activity environments in ways that may promote high consumption of energy-dense foods and low levels of physical activity (5).

Higher body weight is associated not only with somatic health conditions, but also with impaired mental health (6). One important aspect of this relationship is body dissatisfaction, which has been found to be more common among adults living with overweight and obesity than among adults with normal weight, particularly among women (6, 7). This pattern is also reflected in weight-loss attempts, which are more prevalent among individuals with higher BMI and are reported more often by women than men (8, 9).

The prevalence of overweight and obesity is lower in Norway than in Europe overall (5); however, excess weight remains highly prevalent in the Norwegian adult population. In the 2020 Norwegian Public Health Report, overweight or obesity was present in 29% of women and 32% of men aged 18–24 years, increasing to 39% and 53%, respectively, among those aged 25–34 years (10). More recent national data from 2025 showed that 11.9% of women and 12.0% of men aged 18–29 years were classified as having obesity based on self-reported height and weight (11).

Adolescence and young adulthood represent critical periods during which excess weight and related health risks can rapidly accumulate (12), and early adulthood has been identified as a particularly important period for weight gain, especially for women (13). Investigating BMI trajectories from childhood to mid-adulthood, Cleland et al. (14) identified trajectories in which lower BMI in childhood progressed to high BMI in adulthood. These findings highlight the importance of preventing excessive weight gain even among individuals initially considered low risk. A qualitative study of women aged 18–21 years from Northern Norway found that participants were motivated to manage their weight and make lifestyle changes, but that the transition to adulthood, especially moving away from home, made this challenging (15).

Emerging adulthood, spanning the late teens through the twenties, is characterized by major psychological, social, and behavioral transitions during which health-related behaviors are established (16). This is also a period during which many individuals establish families of their own. In Norway, the mean age at first childbirth is 30.4 years for women and 32.3 years for men (17). Among pregnant women, national data from the first antenatal check-up in 2023–2025 showed that 41% were classified as having overweight or obesity (18). Given the well-documented intergenerational associations in BMI and weight status (19–21), weight development during emerging adulthood may have implications not only for individual health trajectories but also for future generations. Further, offspring obesity risk may already be influenced before conception (22).

Despite increasing recognition of early adulthood as a critical period for weight gain, less is known about how BMI and weight-related behaviors develop specifically during the transition from adolescence to young adulthood (12). Studies of weight development commonly use broad age ranges spanning from the late teens into the early thirties when defining or examining young adulthood (23–25), which may obscure potentially important variations in weight gain within this period itself. More knowledge is therefore needed about how BMI and weight-related behaviors develop during the transition from late adolescence to young adulthood, particularly within narrower age ranges and across sexes. To our knowledge, relatively few Nordic studies have specifically examined weight development across this life stage. The Fit Futures study provides an opportunity to examine changes in BMI and weight-related behaviors from late adolescence to young adulthood in a population-based Norwegian cohort.

The present study aimed to examine patterns of BMI, overweight and obesity, and weight-change attempts at ages 18 and 27 using cross-sectional data, and to investigate changes in BMI between these ages using

repeated measurements. Furthermore, the study assessed whether weight-change attempts shifted over time, whether weight-change attempts expressed at age 18 were associated with subsequent BMI changes in young adulthood, and whether these patterns differed between females and males.

We hypothesized that (1) BMI would increase from adolescence to young adulthood in both sexes, (2) weight-change attempts would differ by sex, and (3) weight-loss attempts at age 18 would be associated with smaller subsequent BMI increases by age 27.

Methods

Study population

Fit Futures (FF) is a longitudinal, population-based health study in which participants were originally recruited as adolescents from upper secondary schools. The target population comprised students in their first year of Upper Secondary School, aged 15–16 years living in Tromsø and neighboring municipalities in Northern Norway. The design of the Fit Futures study has been described elsewhere (26), and only the most relevant information is presented here. The study comprises three waves: Fit Futures 1 (FF1) in 2010/2011, Fit Futures 2 (FF2) in 2012/2013, and Fit Futures 3 (FF3) in 2021/2022. The present study utilizes data from FF2 and FF3.

Cross-sectional analyses included 775 participants aged 17–20 years at FF2 and 654 participants aged 26–29 years at FF3. Analyses of repeated measurements were based on 524 participants (294 females and 230 males) with valid BMI measurements at both FF2 and FF3. A flowchart of the recruitment process is presented in Fig. 1.

Figure 1. Flowchart of participant recruitment and analytical samples in the present study.

FF1, Fit Futures 1; FF2, Fit Futures 2; FF3, Fit Futures 3.

Anthropometric measurements

Anthropometric measurements in FF2 and FF3 were conducted by experienced study nurses and study staff following standardized procedures, using a Jenix 102 stadiometer (Dong Sahn Jenix), Seoul, Korea. Weight was measured to the nearest 0.1 kg using an automated electronic scale, and height was measured to the nearest 0.1 cm using a stadiometer. Participants wore light clothing and no footwear.

BMI was calculated as weight divided by height squared (kg/m²). Participants were categorized according to the WHO BMI classifications as underweight (< 18.5 kg/m²), normal weight (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²), or obesity (≥ 30 kg/m²) (27). There were seven participants under 18 years of age at FF2, and for those, age- and sex-specific BMI cut-off points established by the International Obesity Task Force (IOTF) were applied (28).

Weight-change attempts and desired weight

Information about weight-change attempts and desired weight were collected using an electronic questionnaire. At both FF2 and FF3, participants were asked whether they were currently trying to change their body weight using the question: *"At present, are you trying to change your body weight?"* Response options were: *"No"*, *"Yes, I try to put on weight"*, or "*Yes, I try to lose weight"*. Participants who reported trying to change their weight were subsequently asked to report their desired body weight (kg). Accordingly, calculations of desired weight, desired weight change, and desired BMI were based only on participants reporting an attempt to gain or lose weight. Desired weight change was calculated as desired weight (kg) minus measured weight (kg), and desired BMI was calculated using desired weight (kg) and measured height (m), at the respective time point.

Information on weight-change attempts was missing for 20 participants at FF2 and 35 participants at FF3 in the cross-sectional samples. Among participants with repeated BMI measurements (n = 524), 9 had missing information on weight-change attempts at FF2 and 22 at FF3. Consequently, 493 participants had information on weight-change attempts at both time points.

Covariates from questionnaire collected at FF2

Self-rated health was reported using the question: "How do you in general consider your own health to be?" Response options were rated on a five-point Likert scale ranging from "Very poor" to "Excellent". This variable was recoded into three categories: very poor/poor, neither good nor bad, and good/excellent.

Physical activity was based on two questions. Participants were asked how many days per week they were physically active, with response options ranging from less than once a week to almost every day. In addition, they were asked whether they were actively doing sports or physical activity outside school hours (yes/no). Physical activity was recoded into three categories: low, moderate, and high. Participants who reported no physical activity outside school were classified in the low category.

Alcohol consumption was reported using the question: "How often do you drink alcohol?" Response options ranged from "Never" to "4 or more times per week". This variable was recoded into three categories: never, once per month or less, and twice or more per month.

Smoking and snuff use were reported using the questions: "Do you smoke?" and "Do you use snuff?" Response options included "No, never", "In the past, but not now", "Sometimes", and "Daily". Both variables were dichotomized into no/never or past use versus current use (sometimes/daily).

Statistical analysis

Descriptive statistics are presented as means and standard deviations (SD) for continuous variables and as counts and percentages for categorical variables. As weight development and weight-change attempts have been shown to differ by sex (8, 24), all analyses were stratified by sex. Cross-sectional differences in the distributions of BMI categories and weight-change attempts between females and males at FF2 and FF3 were examined using Pearson's chi-square tests. Cross-tabulations of BMI category and weight-change attempts were used to describe how weight-change attempts varied across BMI categories at FF2 and FF3. To assess attrition, we examined whether participants lost to follow-up at FF3 differed from those attending FF3 with respect to age, BMI, sex, and weight-change attempts at FF2. Group differences were assessed using

independent-samples *t*-tests for age and BMI and Pearson's chi-square tests for sex and weight-change attempts.

For participants with repeated measurements, differences in mean BMI between age 18 and 27 years were examined using paired t-tests. Mean BMI change between ages 18 and 27 was compared across the three weight-change attempt groups at age 18 using one-way analysis of variance (ANOVA). The distribution of BMI change across the three weight-change attempt groups was illustrated using box plots.

To examine whether weight-change attempts at age 18 were associated with subsequent BMI change, linear regression models were fitted with ΔBMI (BMI at age 27 minus BMI at age 18) as the outcome. Weight-change attempts at age 18 were included as a categorical predictor with three categories: no attempt to change weight (reference), trying to gain weight, and trying to lose weight. Crude models were further adjusted stepwise for BMI at FF2 and potential confounders and covariates at FF2, including age, self-rated health, physical activity, alcohol consumption, and tobacco use. Covariates were selected a priori based on previous literature and theoretical considerations regarding factors associated with BMI development and weight-related behaviors. Model diagnostics were assessed by visual inspection of residual histograms and normal Q–Q plots. Multicollinearity among covariates was evaluated using variance inflation factors, which did not indicate problematic multicollinearity. Results from the regression analyses are presented as unstandardized regression coefficients (β) with 95% confidence intervals (CI).

Transitions in BMI categories and weight-change attempts between age 18 and 27 years were described using transition matrices. Due to small numbers in the underweight category, underweight was combined with normal weight in the BMI category transition analyses.

Statistical significance was defined as two-sided p-values < 0.05. Analyses were conducted using Stata Statistical Software: Release 19.

ChatGPT (OpenAI) was used to assist with language editing and proofreading of the manuscript. The authors take full responsibility for the content and wording.

Results

Cross-sectional results

In cross-sectional analyses of the two study samples at FF2 and FF3, mean BMI was 23.1 kg/m² among females and 23.4 kg/m² among males at FF2, and 25.7 and 26.2 kg/m², respectively, at FF3. The prevalence of overweight was 13.3% among females and 19.7% among males at FF2, compared with 25.6% and 39.5% at FF3. Obesity was present in 7.5% of females and 8.1% of males at FF2, compared with 19.3% and 16.7%, respectively, at FF3. Characteristics of the study participants are presented in Table 1.

Table 1
Participant characteristics by sex at FF2 and FF3. The Fit Futures study.

	FF2					**FF3**				
	Female (n = 429)		**Male (n = 346)**		***p***	**Female (n = 348)**		**Male (n = 306)**		***p***
Age (years), median (min–max)	18	(17–20)	18	(18–20)		27	(26–29)	27	(26–29)	
Anthropometry, mean (SD)										
Weight (kg)	63.5	(11.9)	75.4	(14.4)		71.1	(14.9)	84.2	(16.2)	
Height (cm)	165.8	(6.7)	179.3	(6.4)		166.4	(6.5)	179.3	(6.7)	
BMI (kg/m²)	23.1	(4.3)	23.4	(4.1)		25.7	(5.4)	26.2	(4.7)	
BMI categories (n, %)					*0.013*					*0.002*
Underweight	20	(4.7)	27	(7.8)		7	(2.0)	4	(1.3)	
Normal weight	320	(74.6)	223	(64.5)		185	(53.2)	130	(42.5)	
Overweight	57	(13.3)	68	(19.7)		89	(25.6)	121	(39.5)	
Obesity	32	(7.5)	28	(8.1)		67	(19.3)	51	(16.7)	
	Female (n = 424)		**Male (n = 331)**			**Female (n = 331)**		**Male (n = 288)**		
Weight change attempts (n, %)					*0.001*					*0.001*
Trying to lose weight	199	(46.9)	82	(24.8)		159	(48.0)	111	(38.5)	
Trying to gain weight	17	(4.0)	83	(25.1)		7	(2.1)	38	(13.2)	
No attempt to change weight	208	(49.1)	166	(50.2)		165	(49.9)	139	(48.3)	
	Female (n = 209)		**Male (n = 163)**			**Female (n = 166)**		**Male (n = 144)**		
Desired weight and BMI, mean (SD)										
Desired weight (kg)	57.7	(7.8)	77.7	(10.1)		64.9	(9.0)	80.9	(9.4)	
Desired weight change (kg)	-8.7	(9.1)	1.1	(12.9)		-11.7	(9.9)	-6.5	(8.7)	

	FF2					FF3				
	Female (n = 429)		**Male (n = 346)**		***p***	**Female (n = 348)**		**Male (n = 306)**		***p***
Desired BMI (kg/m²)	21.0	(2.6)	24.2	(2.6)		23.4	(2.8)	25.0	(2.4)	
	Female (n = 423)		**Male (n = 332)**			**Female (n = 332)**		**Male (n = 288)**		
Other characteristics (n, %)										
Self-rated health										
Bad	19	(4.5)	16	(4.8)		18	(5.4)	22	(7.6)	
Neither good nor bad	78	(18.4)	75	(22.6)		67	(20.2)	64	(22.2)	
Good	326	(77.1)	241	(72.6)		247	(74.4)	202	(70.1)	
Physical activity	**Female (n = 425)**		**Male (n = 332)**			**Female (n = 331)**		**Male (n = 285)**		
Low	192	(45.2)	139	(41.9)		32	(9.7)	64	(22.5)	
Moderate	205	(48.2)	156	(47.0)		187	(56.6)	156	(54.7)	
High	28	(6.6)	37	(11.1)		112	(33.8)	65	(22.8)	
Alcohol	**Female (n = 425)**		**Male (n = 333)**			**Female (n = 332)**		**Male (n = 288)**		
Never	30	(7.1)	29	(8.7)		16	(4.8)	10	(3.5)	
Once per month or less	152	(35.8)	115	(34.5)		128	(38.6)	81	(28.1)	
Twice per month or more	243	(57.2)	189	(56.8)		188	(56.6)	197	(68.4)	
Smoking	**Female (n = 423)**		**Male (n = 333)**			**Female (n = 332)**		**Male (n = 286)**		
No	338	(79.9)	244	(73.3)		314	(94.6)	236	(82.5)	
Yes/sometimes	85	(20.1)	89	(26.7)		18	(5.4)	50	(17.5)	
Snuff	**Female (n = 425)**		**Male (n = 333)**			**Female (n = 332)**		**Male (n = 288)**		
No	266	(62.6)	195	(58.6)		219	(66.0)	151	(52.4)	
Yes/sometimes	159	(37.4)	138	(41.4)		113	(34.0)	137	(47.6)	

BMI, body mass index; FF2, Fit Futures 2; FF3, Fit Futures 3; SD, standard deviation.

	FF2			FF3		
	Female (n = 429)	**Male (n = 346)**	***p***	**Female (n = 348)**	**Male (n = 306)**	***p***

Sample sizes vary across variables due to missing data on weight-change attempts and other covariates.

 Desired weight, desired weight change, and desired BMI were calculated only for participants who reported trying to gain or lose weight. Desired weight change was calculated as desired weight minus measured weight. Desired BMI was calculated using desired weight and measured height. Negative values indicate a desire to lose weight.

P values were calculated using Pearson's chi-square test to compare distributions between females and males.

At FF2, 46.9% of females and 24.8% of males reported trying to lose weight. At FF3, the corresponding proportions were 48.0% and 38.5%.

Among the subgroup of participants who reported trying to change their weight, desired BMI was calculated from reported desired weight and measured height. Mean desired BMI was 21.0 kg/m² among females and 24.2 kg/m² among males at FF2, compared with 23.4 and 25.0 kg/m², respectively, at FF3.

In the attrition analysis, participants lost to follow-up at FF3 did not differ in mean BMI at FF2 (23.24 vs. 23.27 kg/m², $p = 0.936$), weight-change attempts ($\chi^2(2) = 0.48$, $p = 0.788$), or sex distribution ($\chi^2(1) = 2.58$, $p = 0.108$). Participants lost to follow-up were slightly older at FF2 than those attending FF3 (18.38 vs. 18.22 years, corresponding to approximately two months, $p < 0.001$).

Weight-change attempts by BMI category

Tables 2 and 3 display weight-change attempts by BMI category at FF2 and FF3, respectively. At both time points and in both sexes, trying to lose weight was most common among participants with overweight or obesity, whereas making no attempt to change weight was most common among participants with normal weight. Among females with normal weight, 41.2% reported trying to lose weight at FF2, compared with 29.6% at FF3.

Table 2
Weight-change attempts by BMI category and sex at FF2. The Fit Futures study (N = 755).

Weight-change attempt	Underweight		Normal weight		Overweight		Obese		Total
Female, n (%)									
No	10	(52.6)	178	(56.0)	15	(26.8)	5	(16.1)	208
Trying to gain weight	8	(42.1)	9	(2.8)	0	(0)	0	(0)	17
Trying to lose weight	1	(5.3)	131	(41.2)	41	(73.2)	26	(83.9)	199
Total	19	(100)	318	(100)	56	(100)	31	(100)	424
Weight-change attempt	**Underweight**		**Normal weight**		**Overweight**		**Obese**		**Total**
Male, n (%)									
No	7	(25.9)	129	(60.3)	25	(38.5)	5	(20.0)	166
Trying to gain weight	20	(74.1)	58	(27.1)	5	(7.7)	0	(0)	83
Trying to lose weight	0	(0)	27	(12.6)	35	(53.8)	20	(80.0)	82
Total	27	(100)	214	(100)	65	(100)	25	(100)	331

BMI, body mass index.

Table 3
Weight-change attempts by BMI category and sex at FF3. The Fit Futures study (N = 619).

Weight-change attempt	Underweight		Normal weight		Overweight		Obese		Total
Female, n (%)									
No	5	(71.4)	119	(66.5)	29	(34.1)	12	(20.0)	165
Trying to gain weight	0	(0)	7	(3.9)	0	(0)	0	(0)	7
Trying to lose weight	2	(28.6)	53	(29.6)	56	(65.9)	48	(80.0)	159
Total	7	(100)	179	(100)	85	(100)	60	(100)	331
Weight-change attempt	**Underweight**		**Normal weight**		**Overweight**		**Obese**		**Total**
Male, n (%)									
No	0	(0)	74	(60.2)	49	(43.4)	16	(32.7)	139
Trying to gain weight	3	(100)	29	(23.6)	6	(5.3)	0	(0)	38
Trying to lose weight	0	(0)	20	(16.3)	58	(51.3)	33	(67.3)	111
Total	3	(100)	123	(100)	113	(100)	49	(100)	288

BMI, body mass index

Analysis of repeated measurements

Changes in BMI and body weight from age 18 to 27 years

When analysing participants with measurements from both FF2 and FF3, paired t-tests showed a statistically significant increase in mean BMI from age 18 to 27 years in both females and males (both $p < 0.001$). Among females, mean BMI increased from 23.12 (SD 4.30) at FF2 to 25.55 (SD 5.37) at FF3, corresponding to a mean change of 2.43 BMI units (95% CI 2.04–2.82). Among males, mean BMI increased from 23.40 (SD 4.31) at the age of 18 to 26.00 (SD 4.58) at the age of 27, corresponding to a mean change of 2.61 BMI units (95% CI 2.20–3.02).

Mean body weight increased by 7.0 kg (SD 9.4) among females and 8.9 kg (SD 10.1) among males between ages 18 and 27.

BMI transitions from age 18 to age 27

Table 4 shows transitions in BMI categories from age 18 to 27 years. In both sexes, most participants with normal weight at age 18 remained in the normal-weight category at age 27, while 26% of females and 36% of males transitioned into the overweight category. Among participants with overweight at age 18, 52% of females and 30% of males shifted to obesity at age 27.

Table 4
BMI category transitions from age 18 to 27 by sex. The Fit Futures study (N = 524).

Female, n (%)	**Normal weight**		**Overweight**		**Obesity**		**Total**	
Normal weight	160	(68.4)	60	(25.6)	14	(6.0)	234	(100)
Overweight	7	(16.7)	13	(31.0)	22	(52.4)	42	(100)
Obesity	0	(0)	2	(11.1)	16	(88.9)	18	(100)
Total	167	(56.8)	75	(25.5)	52	(17.7)	294	(100)
	Normal weight		**Overweight**		**Obesity**		**Total**	
Male, n (%)								
Normal weight	98	(59.0)	59	(35.5)	9	(5.4)	166	(100)
Overweight	5	(10.9)	27	(58.7)	14	(30.4)	46	(100)
Obesity	1	(5.6)	5	(27.8)	12	(66.7)	18	(100)
Total	104	(45.2)	91	(39.6)	35	(15.2)	230	(100)

Rows represent BMI category at age 18 (FF2); columns represent BMI category at age 27 (FF3). Due to low cell counts, underweight was combined with normal weight.

BMI, body mass index.

Changes in weight-change attempts

Table 5

shows transitions in weight-change attempts from age 18 to 27 years. Among those who reported trying to lose weight at age 18, 69% of females and 71% of males also reported trying to lose weight at age 27. Among those who reported no attempt to change their weight at age 18, 34% of females and 32% of males reported trying to lose weight at age 27.

Table 5. Weight-change attempt transitions from age 18 to 27 by sex. The Fit Futures study (N = 493).

	No		**Trying to gain weight**		**Trying to lose weight**		**Total**	
Female, n (%)								
No	92	(65.7)	1	(0.7)	47	(33.6)	140	(100)
Trying to gain weight	5	(50.0)	3	(30.0)	2	(20.0)	10	(100)
Trying to lose weight	40	(30.8)	1	(0.8)	89	(68.5)	130	(100)
Total	137	(48.9)	5	(1.8)	138	(49.3)	280	(100)
	No		**Trying to gain weight**		**Trying to lose weight**		**Total**	
Male, n (%)								
No	59	(56.2)	12	(11.4)	34	(32.4)	105	(100)
Trying to gain weight	25	(43.9)	18	(31.6)	14	(24.6)	57	(100)
Trying to lose weight	15	(29.4)	0	(0)	36	(70.6)	51	(100)
Total	99	(46.5)	30	(14.1)	84	(39.4)	213	(100)

Rows represent weight-change attempts at age 18; columns represent weight-change attempts at age 27. Cell values indicate frequencies and row percentages.

Associations between weight-change attempts and BMI change

The one-way ANOVA showed no significant differences in mean BMI change across the three weight-change attempt groups at age 18 in either females or males (both $p > 0.05$).

Weight-change attempts at age 18 were not statistically significantly associated with changes in BMI between ages 18 and 27 in either females or males. In the fully adjusted models, neither trying to gain nor trying to lose weight at age 18 was significantly associated with subsequent BMI change. Among females, the estimates were $\beta = -0.97$ (95% CI − 3.09 to 1.15, $p = 0.366$) for trying to gain weight and $\beta = -0.67$ (95% CI − 1.57 to 0.22, $p = 0.139$) for trying to lose weight. Corresponding estimates among males were $\beta = 0.02$ (95% CI − 0.97 to 1.01, $p = 0.967$) and $\beta = 0.23$ (95% CI − 0.88 to 1.34, $p = 0.683$), respectively. Figure 2 illustrates the distribution of BMI change across the three weight-change attempt groups.

Figure 2. Distribution of BMI change according to weight-change attempt at age 18, stratified by sex.

Boxes represent the 25th and 75th percentiles, with the horizontal line indicating the median. Dots indicate observations outside the whiskers. P values are from one-way analysis of variance (ANOVA) comparing mean BMI change (kg/m2) across the three weight-change attempt groups separately for females and males.

Discussion

This population-based cohort study spanning a nine-year period showed substantial increases in BMI between late adolescence and young adulthood. Comparing the two cross-sectional samples at ages 18 and 27, the prevalence of overweight and obesity doubled in both females and males. Importantly, the prevalence of obesity more than doubled among females and doubled among males, affecting one in five females and one in six males by age 27. Among participants with repeated measurements who had overweight at age 18, half of females and nearly one third of males had progressed to obesity by age 27. Weight-loss attempts were common throughout the study period, with around half of females reporting attempts to lose weight at both ages, while among males the proportion increased from 24.8% at age 18 to 38.5% at age 27. Despite the high prevalence and persistence of weight-loss attempts, attempts reported at age 18 were not significantly associated with subsequent BMI changes between ages 18 and 27.

Prevalence and progression of overweight and obesity

At age 27, 45% of females and 56% of males in our study were classified as having overweight or obesity. In the 2020 Norwegian Public Health Survey, overweight or obesity was present in 39% of women and 53% of men aged 25–34 years (10), while a more recent national survey conducted in 2020–2022 reported corresponding proportions of 33% and 51% among women and men aged 20–34 years (29). Thus, by age 27, the prevalence observed in the present study was already comparable to or higher than estimates reported for broader age ranges in young adulthood. Importantly, the present findings also demonstrate substantial weight development within this period. The doubling in the prevalence of overweight and obesity between ages 18 and 27 suggests that broad age ranges spanning much of young adulthood may obscure marked differences in weight status between the earlier and later parts of this life stage.

The high prevalence and marked increase in obesity observed in the present study are particularly concerning. At age 27, 19% of females and 17% of males were classified as having obesity, corresponding to approximately one in five females and one in six males. Moreover, among participants with repeated measurements who had overweight at age 18, 52% of females and 30% of males had progressed to obesity by age 27. For comparison, the 2025 National Public Health Survey showed that 11.9% of women and 12.0% of men aged 18–29 years were classified as having obesity based on self-reported height and weight (11). The prevalence observed in the present study was higher in both sexes, although the estimates are not directly comparable because the national survey was based on self-reported height and weight, whereas anthropometric measurements in Fit Futures were objectively measured. The relatively high prevalence observed in Fit Futures is also consistent with geographical variation reported nationally, with higher obesity prevalence in Northern Norway than in the country as a whole (10, 11, 30).

The progression from overweight to obesity observed between ages 18 and 27 in the present study is of particular clinical concern, as obesity is recognized as a chronic, complex disease and is associated with increased morbidity and mortality (1). In a large Norwegian cohort with objectively measured BMI at age 18–20 and 40–50 years, Kjøllesdal et al. (31) found that among participants with overweight at ages 18–20 years, those who had developed obesity by midlife had a higher risk of cardiovascular mortality than those who remained overweight. Although the time span was considerably longer than in the present study, this finding underlines the potential long-term implications of the progression from overweight to obesity observed already during young adulthood in our study. The prevalence of obesity at age 18 was also substantially higher in the present study than in the historical Norwegian cohort studied by Kjøllesdal et al. (31), in which obesity at ages 18–20 years was present in 1.0% of women and 0.6% of men, compared with 7.5% of females and 8.1% of males in the present study. Although the cohorts are not directly comparable, this difference is consistent with the broader increase in obesity across generations. The high prevalence observed already by age 27 may therefore have important long-term health implications, as obesity established early in adulthood may persist over many years, resulting in prolonged exposure that has been associated with adverse cardiometabolic risk profiles and increased cardiovascular mortality (31, 32).

The increasing prevalence of obesity observed in the present study is also consistent with broader international trends towards a greater burden of obesity at younger ages. GBD 2021 Adolescent BMI Collaborators (2) reported that between 1990 and 2021, the combined prevalence of overweight and obesity among individuals aged 5–24 years doubled globally, while the prevalence of obesity alone tripled. They further described a shift towards obesity constituting an increasingly large proportion of excess weight in several regions, with further increases in obesity forecast towards 2050. Although their study included individuals only up to age 24, these trends provide an important international context for the marked increase in obesity observed between ages 18 and 27 in the present study. Nielsen et al. (19) reported a high burden of obesity in young adulthood, with approximately 30% of participants having obesity by age 30. The higher prevalence reported by Nielsen et al. than observed in the present study may reflect differences between the Norwegian and US populations, as well as the older age of participants in their study.

BMI development during emerging adulthood

Among participants with repeated measurements, mean BMI increased substantially in both females and males from age 18 to 27 years, corresponding to a mean body weight increase of 7.0 kg among females and 8.9 kg among males. The mean changes in BMI were relatively similar between sexes. The increase in mean BMI was also reflected in changes in BMI categories: among participants who were in the normal-weight category at age 18, 32% of females and 41% of males were classified as having overweight or obesity by age 27. Thus, unfavorable weight development was not confined to participants who already had excess weight in late adolescence. These findings align with previous longitudinal studies demonstrating substantial weight gain during early adulthood (12, 24), a period that has been identified as particularly vulnerable for weight gain and the development of long-term BMI trajectories (12, 13). In a life-course study spanning adolescence to old age, Yang et al. (12) found that BMI increased from adolescence to midlife in both women and men, with more recent birth cohorts showing higher BMI levels and steeper increases. Similarly, Dutton et al. (24) found weight gain across a 25-year follow-up, although trajectories differed by sex. Women experienced the largest increases during the first 10–15 years of adulthood, whereas men showed a steadier increase throughout adulthood. Cleland et al. (14) found that nearly half of participants experienced worsening BMI trajectories

from childhood to mid-adulthood, including trajectories characterized by progression from lower BMI in childhood to high BMI in adulthood.

Together, these findings support the notion that emerging adulthood may represent a particularly vulnerable period for unfavorable weight development, even among individuals initially considered low risk. This period is characterized by major psychological, social, and behavioral transitions, during which health-related behaviors are established and maintained into adulthood (16). The implications may also extend beyond individual health, as parental weight before conception may influence the health of future offspring (22).

Weight-change attempts and weight perception

Clear sex differences in weight-change attempts were observed at age 18, with females more often reporting attempts to lose weight and males more often reporting attempts to gain weight. The observed sex differences in weight-change attempts may reflect gender-specific body ideals. Although appearance ideals vary across cultural contexts, increasingly globalized body ideals emphasize thinness, toning, and appearance among women, and muscularity and leanness among men (33). Notably, in this study around 40% of females within the normal-weight category reported attempts to lose weight already at age 18, while many males with normal weight reported attempts to gain weight during late adolescence.

The proportion of women in the normal-weight category reporting attempts to lose weight decreased to around 30% at age 27. At the same time, weight-loss attempts among women were persistent in this study as approximately 70% of women who reported attempts to lose weight at age 18 also reported attempts to lose weight at age 27. In addition, approximately 30% of women who reported no attempts to change weight at age 18 reported attempts to lose weight at age 27. As the questionnaire specifically asked whether participants were currently making attempts to change their weight, rather than whether they wished to change weight, the actual proportion of participants with weight-related concerns may have been higher. These findings are consistent with previous research showing that women generally report greater body dissatisfaction and more weight-loss attempts than men (7–9). Saunders et al. (34) further found that women across BMI categories report high levels of body dissatisfaction, with dissatisfaction and internalized weight stigma increasing alongside BMI. A similar pattern was observed in the present study, where attempts to lose weight were more common among participants with overweight or obesity than among those with normal weight, in both sexes and at both ages. Among males in the present study, the proportion reporting attempts to lose weight increased between ages 18 and 27, during the same period in which mean BMI increased substantially. This may suggest that weight-related concerns became more prominent as body weight increased.

The desired-weight data provide an additional perspective on weight perception. Among participants who reported trying to change their weight, desired BMI was higher at age 27 than at age 18 in both females and males. However, the discrepancy between measured and desired weight was also larger at age 27, particularly among females. This may be consistent with some adaptation to higher body weight with age, although the discrepancy between measured and desired weight remained substantial. A similar pattern was observed by Aars and Jacobsen (35) in a 13-year follow-up of adults aged 25–69 years from Tromsø, where desired body weight increased over time, but to a lesser extent than actual body weight. Although their participants covered an older and considerably broader age range than in the present study, the discrepancy between changes in actual and desired weight was greatest among younger adults.

Weight-change attempts and subsequent BMI development

Despite the high prevalence of weight-change attempts, attempts reported at age 18 were not associated with subsequent BMI changes between ages 18 and 27. The absence of an association raises questions about what self-reported weight-change attempts actually represent. Sustained weight loss and weight-loss maintenance generally require structured and long-term weight-management strategies, often involving individualized behavioral support (36). The question used in the present study did not assess the duration, intensity, or specific strategies involved in the reported attempts and may have been interpreted differently between participants. Thus, reporting a current weight-change attempt may encompass a broad range of behaviors and motivations rather than sustained or structured weight-management strategies. This may partly explain why weight-change attempts reported at age 18 were not associated with smaller subsequent BMI increases by the late twenties.

The lack of association between weight-change attempts at age 18 and subsequent BMI development may also be viewed in light of the complex and multifactorial nature of obesity. Although weight gain ultimately reflects a sustained positive energy balance, this does not imply that weight development is determined by lifestyle choices alone. Genetic and biological factors interact with psychological, behavioral, social, and environmental factors that influence energy intake and expenditure (3, 5). The concept of obesogenic environments further emphasizes that food choices and physical activity occur within social, physical, cultural, economic, and political conditions that may facilitate or constrain weight management (5). From this perspective, the present finding may indicate that individual motivation and attempts to change weight operate within broader conditions that influence the possibility of achieving and maintaining weight change. Prevention strategies should therefore not rely solely on individual behavior change but also address the wider and structural determinants that shape opportunities for healthy eating and physical activity.

Taken together, the present findings may indicate that although attempts to change weight are common during emerging adulthood, such attempts alone may be insufficient to prevent substantial increases in BMI over time.

Strengths and limitations

A major strength of this study is the population-based design with repeated measurements across a relatively narrow and clinically relevant age range, spanning late adolescence to young adulthood. Importantly, height and weight were objectively measured by trained study staff using standardized procedures at both time points, avoiding reliance on self-reported anthropometric data. The original Fit Futures cohort achieved near-complete coverage of the defined target population, with 1038 of 1117 invited students (93%) participating. Attendance rates were 77% at FF2 and 61% at FF3. Despite the approximately nine-year interval between FF2 and FF3, 524 participants had valid BMI measurements at both time points and could be included in the repeated-measurement analyses. Although females constituted a somewhat larger proportion of the study samples, both females and males were well represented. The attrition analysis showed no differences in sex distribution, BMI, or weight-change attempts at FF2 between participants attending FF3 and those lost to follow-up. Participants lost to follow-up were slightly older at FF2, corresponding to a difference of approximately two months. Although statistically significant, this small age difference is unlikely to be of clinical relevance and further reflects the narrow age range of the study population. Overall, the similarity

between the groups suggests that attrition is unlikely to have introduced substantial selection bias in the repeated-measurement analyses.

Several limitations should also be considered. Weight-change attempts were self-reported and assessed using a single question asking whether participants were currently trying to change their body weight. Reporting a current attempt to change weight is not equivalent to wishing or intending to change weight, as participants may have desired weight change without actively attempting it at the time of assessment. The question may also have been interpreted differently between participants and did not provide information about the duration, intensity, or specific strategies involved in the reported attempts. Self-reported weight-change attempts may additionally be subject to reporting and social desirability bias. Desired weight and desired BMI were calculated only among participants who reported currently trying to gain or lose weight. These estimates therefore represent a selected subgroup rather than the full study sample, which may influence the observed estimates of desired weight and BMI. The lack of detailed dietary data allowing estimation of participants' total energy intake is a further limitation. We were therefore unable to account for energy intake in the regression analyses examining the association between weight-change attempts at age 18 and subsequent BMI change.

The prevalence of overweight and obesity and self-reported attempts to change weight may vary according to cultural, ethnic, and contextual factors. Consequently, the findings may not be fully generalised to populations with backgrounds that differ from those of the study cohort.

Finally, although height and weight were objectively measured, BMI does not distinguish between fat mass and lean mass. This is particularly relevant when interpreting desired weight and BMI among males, for whom a higher desired body weight may reflect a desire for greater muscularity. Despite its limitations for assessing body composition at the individual level, BMI is considered a valid indicator of body adiposity at the population level and in epidemiological studies (3, 37).

Conclusions

Weight development between ages 18 and 27 was substantial in both females and males. The combined prevalence of overweight and obesity doubled in both sexes during this period. Of greater concern, the prevalence of obesity alone more than doubled among females and doubled among males. Weight-loss attempts were already common at age 18 and remained prevalent at age 27, with an increase among males. Despite the high prevalence and persistence of weight-loss attempts, attempts reported at age 18 were not associated with subsequent BMI changes. These findings support the need for population-level obesity prevention strategies that extend beyond individual behavior change and address broader societal and structural determinants of weight development.

Abbreviations

BMI, body mass index

CI, confidence interval

FF, Fit Futures

FF1, Fit Futures 1

FF2, Fit Futures 2

FF3, Fit Futures 3

IOTF, International Obesity Task Force

WHO, World Health Organization

ANOVA, analysis of variance

SD, standard deviation

Declarations

Ethics approval and consent to participate
The study was conducted according with the Declaration of Helsinki and approved by the Regional Committee for Medical and Health Research Ethics, REK North (reference no. 2009/1282 and 2021/212504). The project period was subsequently extended and approved until 31 December 2027. All participants received information about the study prior to participation and provided informed consent, either on paper or digitally. The processing of personal data was assessed by the Norwegian Centre for Research Data (NSD, now Sikt) in accordance with applicable data protection regulations.

Clinical trial number

Not applicable.

Consent for publication
Not applicable.

Availability of data and materials
The datasets used in the current study are not publicly available due to privacy and data protection restrictions. Data from the Fit Futures Study are available upon reasonable request and application. More information can be found at https://uit.no/research/fitfutures_en#region_837245

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions
EH conceived the study in collaboration with ASS and EKE. EH performed the statistical analyses, interpreted the data, and drafted the manuscript. ASS and EKE contributed to the study design, interpretation of the

findings, and supervision of the work, and critically revised the manuscript. ASF was the PI of the Fit Futures study and contributed to the interpretation of the findings and critical revision of the manuscript. All authors read and approved the final manuscript.

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Figures

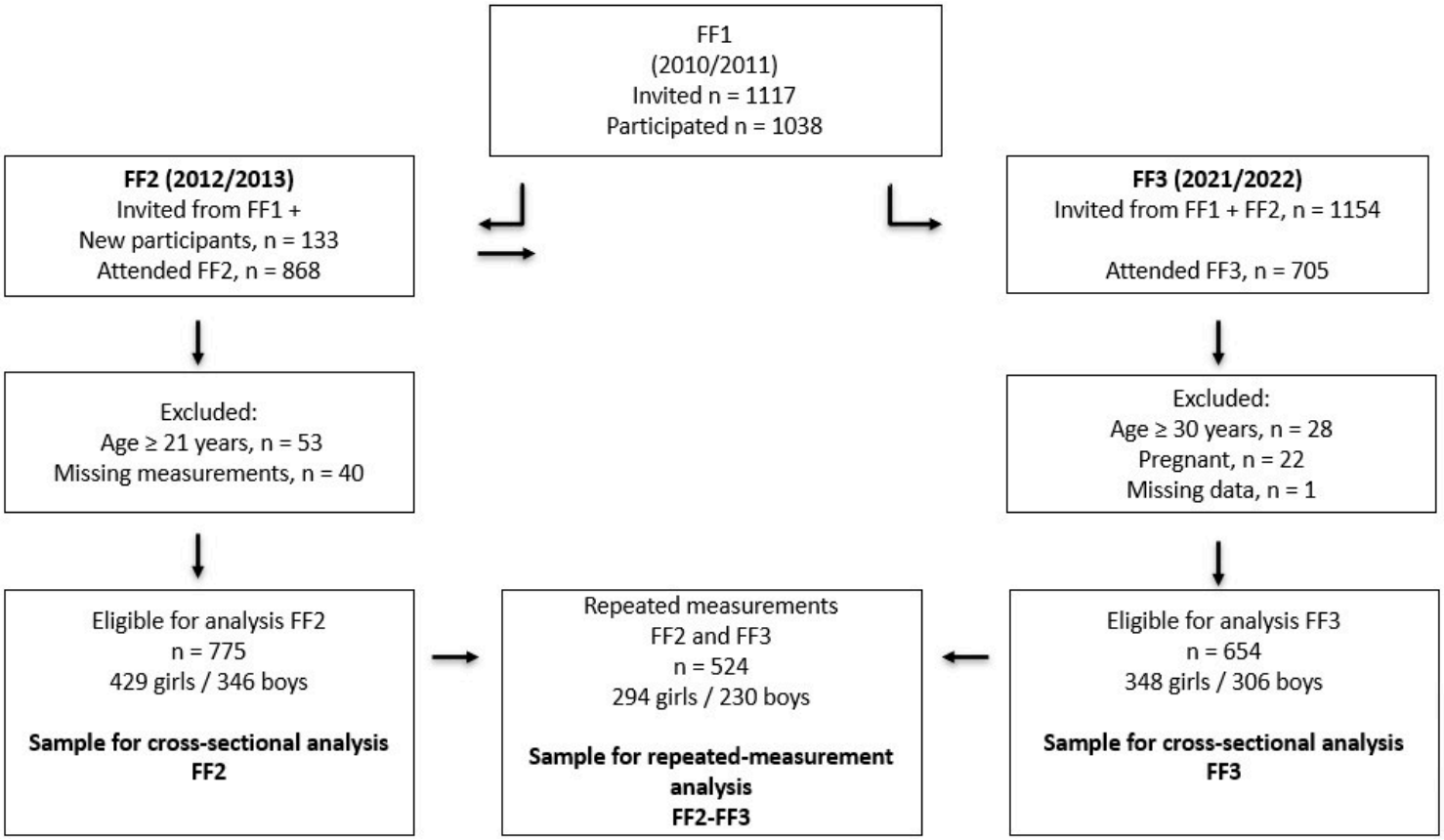


Figure 1

Flowchart of participant recruitment and analytical samples in the present study.

FF1, Fit Futures 1; FF2, Fit Futures 2; FF3, Fit Futures 3.

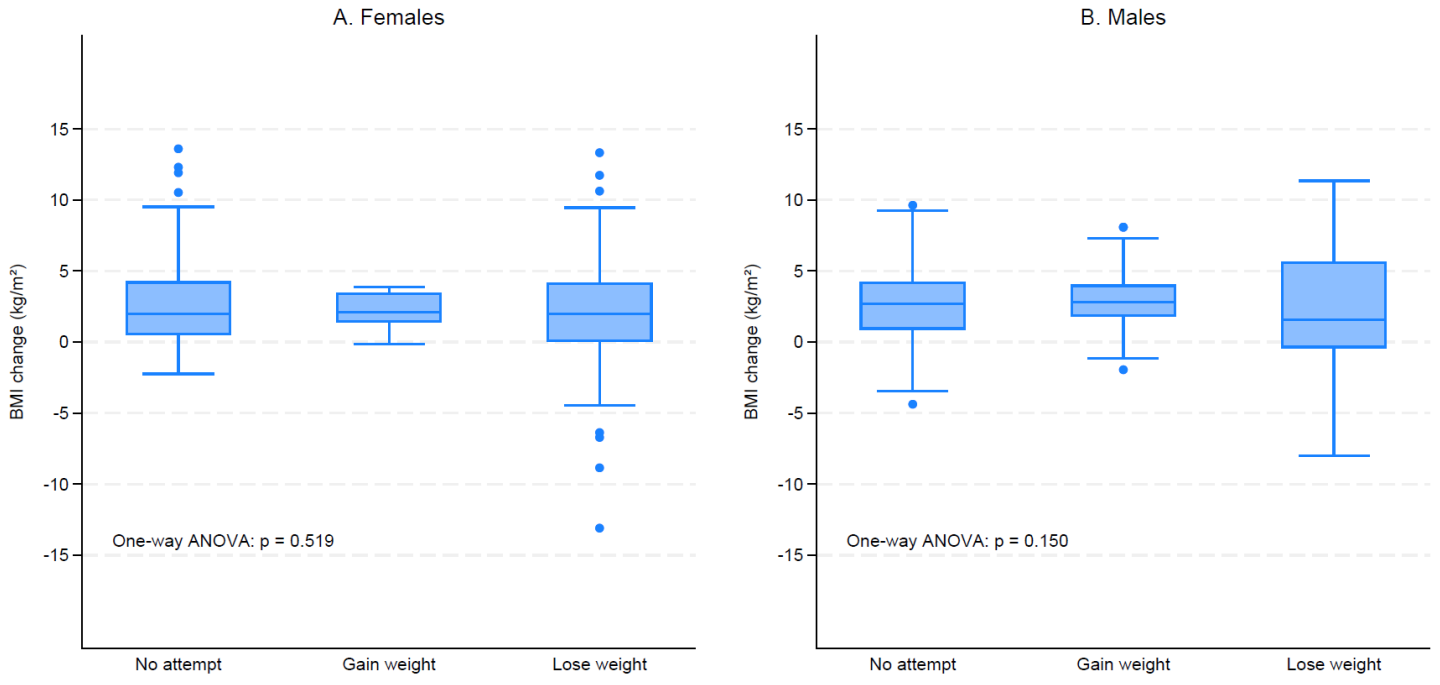


Figure 2

Distribution of BMI change according to weight-change attempt at age 18, stratified by sex.

Boxes represent the 25th and 75th percentiles, with the horizontal line indicating the median. Dots indicate observations outside the whiskers. P values are from one-way analysis of variance (ANOVA) comparing mean BMI change (kg/m2) across the three weight-change attempt groups separately for females and males.