

ORIGINAL ARTICLE

Health at age 17 in Norwegian adolescents: Mental and physical status in the national cohort born in 2001

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Abstract

Aims: We present self-reported data on physical and mental health at age 17 years from 82% of Norwegians born in 2001. **Methods:** In Norway, the Armed Forces require that each resident who reaches the age of 17 years completes a self-administered declaration of health that is used for military selection. The declaration collects information on height and weight, various clinically diagnosed diseases, mental and behavioural disorders, and other health conditions where clinical diagnosis is not required. In 2018, there were 65,913 adolescents born in 2001 living in Norway, of whom 10,223 were exempt from completing the declaration; declarations were therefore sent to 55,690 participants. We included 54,132 participants who completed the declaration (response rate 97.2%): 27,220 male and 26,912 female respondents. **Results:** We found that 18% of male and 28% of female respondents reported at least one clinically diagnosed disease, mental disorder or behavioural disorder. Among health condition where clinical diagnosis was not required, 19% of male and 37% of female respondents reported anxiety/depression affecting daily life and 10 versus 18% reported migraines/recurring headaches. The respondents probably represent the healthiest part of the total cohort of 17-year-old Norwegians because those who are exempt from completing the declaration are already considered unfit for military service. **Conclusions:** **These data represent a rich resource for further research. Similar data exist for the birth cohorts in 1993–2003. We encourage further research that can help decision-makers identify areas of concern that should be targeted for interventions.**

Keywords: *Adolescents, self-reported health data, mental health, physical health, conscription*

Background

During adolescence, young people establish their basis for functioning and their health trajectories in adulthood. During this crucial phase, there is a gradual transition from parental responsibility for health during childhood to personal responsibility for one's own health. The status of adolescent health is immensely important for the future development of societies and to ensure that the next generations can realise their potential [1].

Recent trends have revealed alarming developments in adolescent health. The global increase in

overweight and obesity among young people is of major concern [2,3] due to its long-term association with the risk of remaining obese as an adult, cardiovascular disease and diabetes, as well as a number of other serious health consequences [4,5]. Rates of mental health problems and self-harm are also steadily rising among adolescents [6–8] and confer a high risk of premature death or severe morbidity [9]. Despite the need to closely monitor the development of such serious conditions, few countries can provide national data on their magnitude, partly because adolescents tend to have limited contact with the

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healthcare system, leading to a lack of data on this age group in national patient registries.

National estimates of health conditions such as asthma, allergic rhinitis and atopic eczema are also lacking for young people. The studies that do exist often have small sample sizes and there are large variations in the reported prevalence worldwide [10]. Countries that have national registry data available may provide reliable prevalence estimates for severe cases of these conditions and the use of related medication [11]. However, although these data may aid in epidemiological surveillance [11], registries do not capture those who go untreated or who treat their conditions with over-the-counter medication, such as those with less severe allergies and pain.

Self-reported health data has proved to be a useful tool for surveillance and risk assessment [12]. However, the validity of such data depends on a high response rate and representativeness among respondents, which is often difficult to achieve when addressing young people [13,14].

Aims

The aim of this study was to present self-reported data on physical and mental health at age 17 years from 82% of Norwegians born in 2001.

Methods

Data source and participants

In Norway, the Armed Forces require that each resident who reaches the age of 17 years completes a self-administered declaration of health that is used for military selection, in accordance with the Act on Conscription and Service in the Armed Forces [15]. The declaration is internet-based and respondents must identify themselves electronically before they can answer the questions. After completing the declaration and before submitting, respondents must confirm that they understand that incorrect answers can lead to criminal liability under the law.

The Armed Forces' Human Relations and Conscription Center is the body that sends declarations to young people. Each year, they collect information about all potential conscripts from various public registries, including information about health, education, licences and certificates, skills, work experience and social security benefits and penalties, in accordance with the Regulations on Conscription and Home Guard Service. Persons whom the Norwegian Armed Forces' Human Relations and Conscription Center consider unfit for military service based on this information are exempt from completing the declaration. These people may have

unsatisfactory health, insufficient qualifications and skills, insufficient physical capacity, insufficient ability to learn or do not meet the requirements for good conduct and lifestyle [15]. The health requirements for military service are described in the Provision for Military Health Service and Medical Assessment [16]. Data from the declarations are stored in the Norwegian Armed Forces Health Registry and are available for research and statistical purposes in accordance with the regulations of the registry [17].

In 2018, there were 65,913 people born in 2001 living in Norway, of whom 10,223 were exempt from completing the declaration. Declarations were therefore sent to 55,690 people; 54,132 completed the declaration (response rate 97.2%): 27,220 male respondents and 26,912 female respondents. The mean age of the study sample at the time they completed the declaration was 17 years and five months, among both sexes. Taking into account exempted people, this descriptive study includes 82.1% of all 17 year olds who lived in Norway in 2018 (Figure 1).

Measures

The declaration of health starts with a question about whether the respondent is motivated for military service, followed by a section with questions about height, weight and physical performance. We used reported height and weight to calculate body mass index (BMI) (kg/m^2), which we classified as underweight ($\text{BMI} \leq 18.5$), normal weight ($\text{BMI} > 18.5$ and < 25), overweight ($\text{BMI} \geq 25$ and < 30) and obese ($\text{BMI} \geq 30$) [18]. We calculated the mean height, weight and BMI for male and female respondents separately, as well as the proportion in each BMI group.

In the next part of the declaration, respondents report on the presence of several clinically diagnosed (i.e. diagnosed by a medical doctor or clinical psychologist) diseases, mental disorders and behavioural disorders. Psychosis, anxiety, depression and social phobia were reported as one item in the questionnaire, whereas eating disorder, self-harm and neurodevelopmental disorders (attention deficit disorder/attention deficit hyperactivity disorder (ADD/ADHD)/hyperkinetic/Tourette's/Asperger's) were reported as separate items. Respondents could report more than one disease/disorder. Respondents also report on other health conditions for which a clinical diagnosis is not required, such as anxiety/depression, asthma, allergies, eczema and headaches and their severity. As previous studies have shown large female-male differences in self-reported health [19], we stratified by sex and present the proportion of the

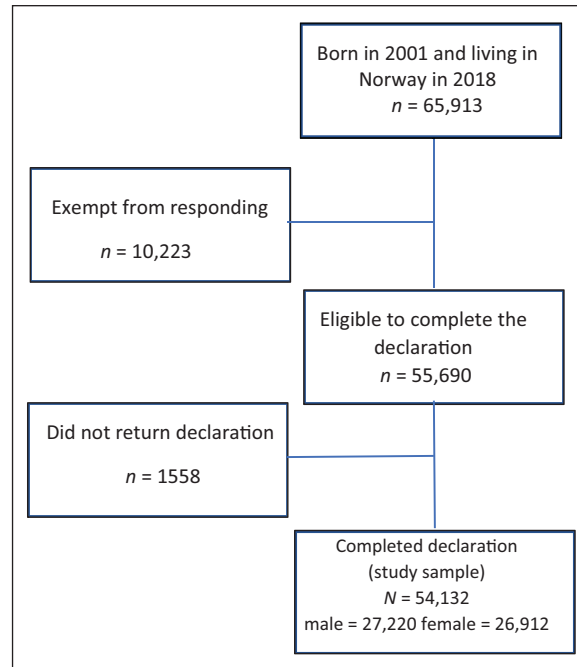


Figure 1. Flowchart showing the selection of study participants.

Table I. Mean self-reported height, weight and number and proportion of underweight, overweight and obese participants among 54,132 Norwegian adolescents born in 2001 (declaration of health completed in 2018).

	Male sex ($n = 27,220$)	Female sex ($n = 26,912$)
Height (m) ^a	1.81 (2)	1.67 (2)
Weight (kg) ^a	74.4 (0)	63.4 (0)
BMI (kg/m ²) ^a	22.8 (2)	22.7 (2)
Underweight (BMI ≤ 18.5) ^b	2063 (7.6)	2290 (8.5)
Overweight (BMI 25–29.99) ^b	4006 (14.7)	3973 (14.8)
Obese (BMI ≥ 30) ^b	1566 (5.8)	1341 (5.0)

^aValue in parentheses is number of participants with missing data.

^bData presented as n (%).

BMI: body mass index.

study sample that reported each disease, disorder or health condition.

Ethics approval

Data supporting the findings of this study are administered by the Norwegian Armed Forces Health Registry, a central health registry with data from Norwegian Armed Forces personnel, including conscripts, and civilian and military staff. Current regulations authorise the Norwegian Armed Forces Health Registry to use anonymous data for research purposes.

Results

Among both sexes, nearly 15% were overweight; 5.8 and 5.0% of male and female respondents, respectively,

were obese (Table I) and 8.5 and 7.6%, respectively, were underweight.

Eighteen per cent of male respondents and 28% of female respondents aged 17 years in 2018 reported at least one clinically diagnosed physical disease, mental disorder or behavioural disorder (Table II). The largest sex difference was observed in eating disorders, which were five times more common among female respondents than male respondents (2.5% of female respondents and 0.4% of male respondents). Other mental and behavioural disorders and self-harm were also reported more frequently among female than male respondents (Table II). Musculoskeletal problems that affected daily life was most frequently reported among female respondents (10.8% of female respondents and 5.1% of male respondents).

Table II. Self-reported clinically diagnosed (diagnosed by medical doctor or clinical psychologist) diseases, mental disorders or behavioural disorders reported among 54,132 Norwegian adolescents born in 2001 (questionnaire answered in 2018).

	Male sex (<i>n</i> = 27,220)	Female sex (<i>n</i> = 26,912)
None of the diseases/disorders in this table	22,194 (81.5)	19,354 (71.9)
<i>Infectious diseases</i>		
Serious infectious disease ^a	31 (0.1)	28 (0.1)
<i>Neoplasms</i>		
Cancer, still not cured or requires follow-up	18 (0.1)	23 (0.1)
<i>Blood and blood-forming organs</i>		
Bleeding disorder	102 (0.4)	74 (0.3)
<i>Endocrine and metabolic diseases</i>		
Diabetes, any type	102 (0.4)	84 (0.3)
<i>Mental and behavioural disorders</i>		
Psychosis, anxiety, depression, social phobia ^b	726 (2.7)	2056 (7.6)
Eating disorders	111 (0.4)	671 (2.5)
Self-harm	290 (1.1)	1282 (4.8)
ADD/ADHD/hyperkinetic or Tourette's/Asperger's	991 (3.6)	417 (1.6)
<i>Diseases of the nervous system</i>		
Epilepsy, still in need of follow-up	52 (0.2)	72 (0.3)
Neurological disease ^c	55 (0.2)	78 (0.3)
<i>Diseases of the ear</i>		
Deafness or severely reduced hearing	175 (0.6)	142 (0.5)
<i>Diseases of the circulatory system</i>		
Hypertension in need of medication	23 (0.1)	22 (0.1)
Heart disease/arrhythmia in need of follow-up	165 (0.6)	137 (0.5)
<i>Diseases of the respiratory system</i>		
Spontaneous pneumothorax	28 (0.1)	22 (0.1)
<i>Diseases of the digestive system</i>		
Chronic gastrointestinal disease in need of medication	187 (0.7)	202 (0.8)
<i>Coeliac disease/gluten intolerance</i>		
Yes, but no symptoms with gluten-free diet and tolerate small amounts	282 (1.0)	396 (1.5)
Yes, symptoms even with gluten-free diet	129 (0.5)	229 (0.9)
<i>Lactose intolerance</i>		
Yes, no symptoms with lactose-free diet and tolerate small amounts	834 (3.1)	1196 (4.4)
Yes, symptoms even with lactose-free diet	183 (0.7)	377 (1.4)
<i>Diseases of the musculoskeletal system</i>		
Musculoskeletal problems affecting daily life	1378 (5.1)	2914 (10.8)
Arthritis/Bechterew's disease, other rheumatic disease	61 (0.2)	138 (0.5)
Surgically treated prolapse in neck/back	23 (0.1)	22 (0.1)
<i>Diseases of the genitourinary system</i>		
Chronic urinary tract disease	13 (0.0)	47 (0.2)
Wet your bed the last three years	106 (0.4)	43 (0.2)
<i>Congenital malformations, deformations, chromosomal abnormalities</i>		
Neurodevelopmental disorder	119 (0.4)	72 (0.3)
<i>Injury poisoning and certain consequences of external causes</i>		
Dislocated shoulder	287 (1.1)	200 (0.7)
Severe allergic reaction ^d	408 (1.5)	340 (1.3)
<i>Ever had surgery in back, hip, knee or other part of skeleton</i>		
No	25,188 (92.6)	25,327 (94.2)
Yes, and fully functional	1520 (5.6)	887 (3.3)
Yes, still problems and decreased function	495 (1.8)	685 (2.5)
<i>Ever had surgery in other part of body</i>		
No	21,835 (80.3)	22,604 (84.0)
Yes, symptom-free and fully functional	4836 (17.8)	3681 (13.7)
Yes, still problems and decreased function	532 (2.0)	614 (2.3)
Other condition making you unfit for service	264 (1.0)	386 (1.4)

Data presented as *n* (%).

ADD: attention deficit disorder, ADHD attention deficit and hyperactivity disorder.

^aSerious disease either still contagious or in need of treatment (HIV, hepatitis B, hepatitis C).

^bIn need of treatment by a doctor/psychologist.

^cEither leading to paralysis or reduced functionality in everyday life.

^dLeading to hospital admission or administration of adrenalin.

Among health conditions where clinical diagnosis is not required, pollen allergy was reported by 29.5% of male respondents and 26.6% of female respondents, while 8.8% of male respondents and 12.2% of

female respondents reported symptomatic allergies all year (Table III). Female respondents reported skin conditions more often than male respondents. Monthly headaches or migraines were reported by

Table III. Self-reported health conditions (clinical diagnosis not required), among 54,132 Norwegian adolescents born in 2001 (questionnaire answered in 2018).

	Male respondents	Female sex
<i>Asthma or other severe lung disease</i>		
No	24,794 (91.1)	24,208 (90.0)
Yes, medication occasionally	1434 (5.3)	1287 (4.8)
Yes, need medication with activity	597 (2.2)	891 (3.3)
Yes, use medication daily	378 (1.4)	513 (1.9)
<i>Pollen allergy</i>		
No	19,188 (70.5)	19,732 (73.4)
Yes, use no medication, few/none symptoms	2947 (10.8)	2275 (8.5)
Yes, use medication in season and little/no symptoms	3138 (11.5)	2593 (9.6)
Yes, use medication and still symptoms	1930 (7.1)	2299 (8.5)
<i>Symptomatic allergies all year</i>		
No	24,817 (91.2)	23,605 (87.8)
Yes, use no medication, few/none symptoms	1227 (4.5)	1442 (5.4)
Yes, use medication and little/no symptoms	887 (3.3)	1353 (5.0)
Yes, use medication and still symptoms	272 (1.0)	499 (1.9)
<i>Eczema, psoriasis or other dermatological disorder</i>		
No	24,282 (89.3)	22,851 (85.0)
Yes, use no ointment	1014 (3.7)	963 (3.6)
Yes, use ointments occasionally	1388 (5.1)	2139 (8.0)
Yes, daily ointments for long periods	519 (1.9)	946 (3.5)
<i>Migraines or other recurring headaches</i>		
No	24,632 (90.5)	21,930 (81.5)
Yes, but few attacks (0–2 attacks/month)	1979 (7.3)	3171 (11.8)
Yes, frequent attacks (>2 attacks/month)	592 (2.2)	1798 (6.7)
<i>Debilitating anxiety/depression affecting daily life</i>		
No	21,948 (80.7)	16,975 (63.1)
Yes, to a very small extent	3857 (14.2)	5997 (22.3)
Yes, to a large extent	922 (3.4)	2308 (8.6)
Yes, treatment with doctor or psychologist	476 (1.7)	1619 (6.0)
<i>Tried illegal drugs or doping in the last year</i>		
No	26,038 (95.7)	26,238 (97.5)
Yes, 1–2 times	683 (2.5)	411 (1.5)
Yes, >2 times	482 (1.8)	250 (0.9)

Data presented as *n* (%).

18.5% of female respondents and 9.5% of male respondents. Among female respondents, 36.9% reported that they had at least some degree of anxiety or depression that affected their daily life, compared with 19.3% of male respondents; 14.6% of female respondents reported that this was so severe that it either affected their daily life to a large extent or required treatment with a physician or psychologist, as opposed to 5.1% of the male respondents. Among male respondents, 1.8% reported using illegal drugs or doping more than twice in the last year, compared with 0.9% of the female respondents; 2.5% of male respondents admitted to having tried it one or two times, whereas 1.5% of female respondents answered yes to this (Table III).

Discussion

This paper presents unique self-reported health data from 82% of the 17 year olds living in Norway in 2018. In most surveys, women generally report poorer health than men [19], which is in line with the results

of the present study. The military questionnaire from which the data used in the current study were obtained required that some of the diseases could only be reported if they had been diagnosed by a clinician. We cannot exclude the possibility that female respondents simply visited their physician or other healthcare providers more often, which led to a higher proportion of female respondents with a clinical diagnosis than male respondents. However, for the health conditions that did not require a clinical diagnosis to be reported, this bias should be of less concern.

One-fifth of all respondents reported overweight or obesity. Studies suggest that self-reported anthropometric measurements in young adults are consistent with direct measurements and can be used to calculate BMI for weight classification purposes [20,21]. In a study of 250,000 Norwegian male conscripts born between 1984 and 1994 who had their body height and weight measured when they were between 17 and 20 years old, 7% were obese and 18% were overweight [22]. These numbers are larger than the self-reported numbers from our study,

indicating that we might be underestimating rather than overestimating the proportion of obese or overweight adolescents.

In our study, 11% of female and 5% of male respondents reported musculoskeletal problems that affected their daily life. Chronic musculoskeletal pain among children and adolescents is frequent and more prevalent among girls. A Dutch study found that the prevalence of any self-reported musculoskeletal pain increased from 17.4% among girls and 14.2% among boys at age 11 years to 35.6 and 18.9%, respectively, at age 17 years. Persistent pain was found among 5.1% of the boys and 16.5% of the girls [23]. Possible explanations for the observed sex differences may be that girls are more sensitive to pain [24], girls may be more willing to report musculoskeletal pain or may be more vulnerable to risk factors [25,26].

There is a huge variation in the prevalence of self-reported asthma worldwide. In a study of 463,801 children aged 13–14 years in 56 countries, the reported 12-month prevalence varied between 1.6 and 36.8% [10]. In our study, 8.9% of the male and 10.0% of the female respondents reported asthma in need of medication. This is in line with a Norwegian study that collected data on current asthma [27]. The self-reported prevalence of other atopic conditions in our study also fits well with prevalence estimates from this study [27].

The female respondents were in the majority when it came to mental illness and reported social phobia/anxiety/psychosis/depression, eating disorders and self-harm more often than their male counterparts. This is in line with previous studies, in which women reported higher levels of mental distress [28,29].

The male respondents reported a diagnosis of ADD/ADHD/hyperkinetic disorders or other neurodevelopmental disorders such as Tourette's or Asperger's disease more often than the female respondents in the current analysis (3.6 versus 1.6%). The prevalence of ADHD is estimated to be between 2 and 7% globally, with an average of around 5%, and the ratio between men and women is estimated at 2–3:1 [30]. This is in accordance with our study. The causes of the sex difference in the prevalence of ADHD are not clear. One possible explanation is that the clinical presentation of ADHD can differ between men and women, resulting in specific diagnostic patterns presently not fully understood. Hence women with ADHD may be under-identified [31].

Self-reported use of illegal drugs is more likely to be underestimated than overestimated, but results should be fairly accurate [32]. Our data are unique, as reporting of substance abuse is rare in population groups not diagnosed with a substance abuse disorder

or other comorbidities. We found a lower prevalence of self-reported drug use or doping in the last year compared with reports from surveys in Norway and Europe [33]. This might be due to underreporting in our study, to the selection of participants to whom the declaration was sent, to how adolescents define illegal drugs (cannabis was the main substance reported in other surveys) or to a true decline.

Strengths and limitations

A major strength of the study is that no similar data are available. The data presented are national in scope, with a very high response rate, and the response rates are equal between the sexes. Thus the data are not hampered by selection bias and overcome one of the serious limitations of most existing survey data. The data are consistently collected each year, the collection procedure is always the same and, although some of the questions may be slightly changed, the questionnaire taps the same topics of interest each year. The respondents confirm that they understand that incorrect answers can lead to criminal liability under the law. This may strengthen the validity of the data.

A weakness of the study may be that the collection of these data is a part of the selection process to military service. The design of the questionnaire is therefore primarily for this purpose. This could potentially lead to inaccurate reporting of conditions if the adolescents aimed to avoid selection into conscription service. However, the consistency with prevalence estimates for some of the conditions with other studies suggests that this is not common.

Another limitation is lack of information on 17 year olds who are exempt from the survey as they are already considered unfit for military service. These include people with severe chronic health conditions or a criminal record. This means that we lack data from the proportion of the 2001 cohort that most likely has the greatest burden of disease. However, the data include >80% of the total birth cohort and are valuable for policy-makers when determining which physical and mental health conditions should be targeted as main concerns among adolescents.

Conclusions

We present data on self-reported health in 82% of the total population of 17-year-old adolescents in Norway in 2018. The respondents reported on a broad range of health problems, some of which required a diagnosis from a medical doctor or psychologist. Similar data exist for the birth cohorts of 1993–2003. The data presented are unique and

represent a rich source for further research. We encourage further research that can help decision-makers identify areas of concern. This could prompt national interventions in schools or encourage leisure time activities aimed at alleviating or preventing physical or mental ailments among adolescents.

Declaration of conflicting interests

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