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Adolescents´ lifestyle and bone health – what about the young bones in Norway?

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Introduction

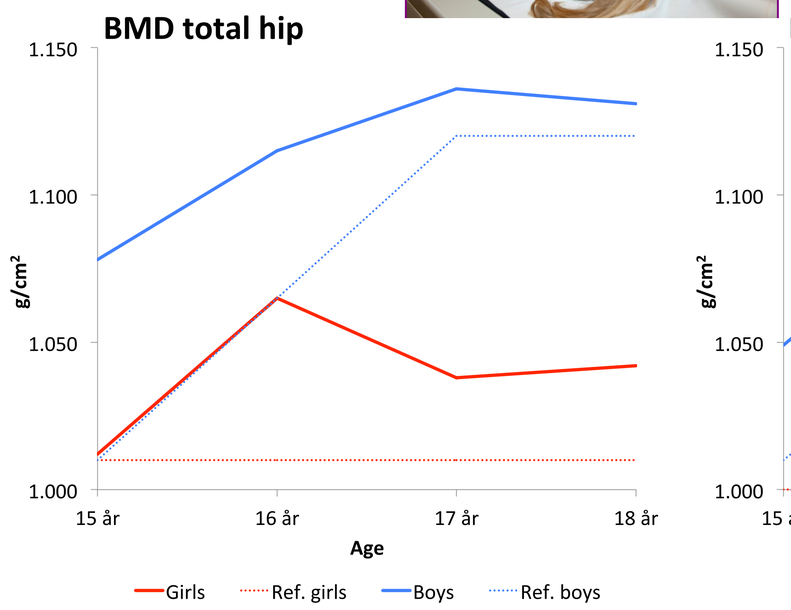
- Norway has one of the highest reported incidences of osteoporotic fracture in the elderly
- Peak bone mass is essential for future fracture risk
- This population-based study compares bone mineral density (BMD) levels in Norwegian adolescents with international reference ranges (Lunar) and explores the assosiation between lifestyle factors and BMD

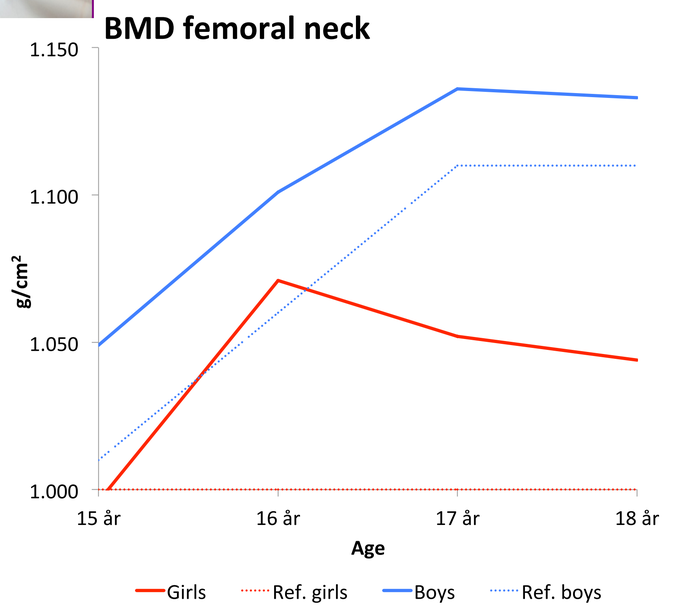
Methods

- *Fit Futures,* The Tromsø Study invited all first years comprehensive school students in the Tromsø region to a cross sectional study in 2010/2011
- 508 girls and 530 boys, the majority aged 15-17 years attended the survey with an attendence rate of 93%
- BMD at the total hip and femoral neck was measured as g/cm^2 by DXA (Lunar Prodigy)
- Lifestyle variables were collected by interviews and self-administered questionnaires

Table 1:
Characteristics of the participants 15-18 years
Height, weight, BMI and BMD are described as mean (SD)
Sexual maturation and lifestyle categories are displayed in %

		GIRLS n= 469	BOYS n= 492	P-value
Height (m)		1,65 (0,06)	1,77 (0.07)	0,000
Weight (kg)		60,9 (11,4)	70,2 (14,4)	0,000
BMI (kg/m^2)		22,4 (4,0)	22,4 (4,2)	0,952
Smoking (%)	Daily	3,6	3,0	0,293
Snuff (%)	Daily	19,2	27,4	0,008
Alcohol (%)	≥ 2 times a month	30,1	29,5	0,003
Physical activity (%)	Sedentary	13,9	29,1	0,000
	Moderate	40,1	24,8	
	Sports	29,2	22,2	
	Hard training	16,4	22,6	
Sexual maturation	Early/ Completed	31,3	6,7	
	Intermediate/ Underway	45,2	57,9	
	Late/Barely started	21,7	14	
BMD g/cm^2	Total hip	1,059 (0,123)	1,114 (0,147)	0,000
	Femoral neck	1,067 (0,123)	1,101 (0,150)	0,000





For all age groups and both sexes, the mean BMD at both sites were consistently higher than the reference values, although mostly non-significantly

Table 2:
GIRLS n= 469 : Association between characteristic , lifestyle and BMD total hip and femoral neck

		Total hip		Femoral neck	
		Beta	P-value	Beta	P-value
BMI		0,006	0,061	0,003	0,380
Menarche age <12,5 years		Ref.			
Menarche age 12,5 -13,9 years		- 0,084	0,022	- 0,106	0,004
Menarche age ≥14 years		- 0,162	0,019	- 0,203	0,003
Physical activity - sedentary		Ref.			
Exercise > 4 hours a week		0,012	0,422	0,017	0,272
Sports		0,037	0,023	0,046	0,005
Hard training		0,129	0,000	0,135	0,000
Interaction BMI*sexual maturation		0,003	0,091	0,003	0,021
R^2 / R^2 Adjusted		24,2%/23,1%		22,1%/21,1%	

Table 3:
BOYS n= 492 : Association between characteristic , lifestyle and BMD total hip and femoral neck *PDS=Puberty Development Scale

		Total hip		Femoral neck	
		Beta	P-value	Beta	P-value
BMI		0,010	0,000	0,010	0,000
Mean PDS score: Barely started		Ref.			
Mean PDS-score: Underway		0,021	0,211	0,040	0,020
Mean PDS=4: Completed		0,062	0,023	0,089	0,001
Physical activity - sedentary		Ref.			
Exercise > 4 hours a week		0,010	0,561	0,025	0,160
Sports		0,087	0,000	0,103	0,000
Hard training		0,163	0.000	0,166	0,000
Alcohol (No/Yes)		0,036	0,013	0,030	0,029
Smoke (No/Yes)		- 0,035	0,037	----	----
R^2 / R^2 Adjusted		30,7%/29,2%		30,3%/29,0%	

Main results and conclusion:

- Despite the heavy fracture burden in the elderly, BMD levels appears similar, or possibly higher, in Norwegian adolescents compared to other age-matched European adolescents
- Sexual maturation, BMI and physical activity explain a significant proportion of the variation in BMD in both sexes. Smoking and alcohol intake also influence BMD in boys
- In both sexes, higher BMD levels were observed at the highest physical activity levels, with effects of more than 1SD in those involved in competition or hard training
- The authorities advice of minimum 60 minutes exercise a day for adolescents is also beneficial for bone