The Trøndelag Health Study

The HUNT Study

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NOFE
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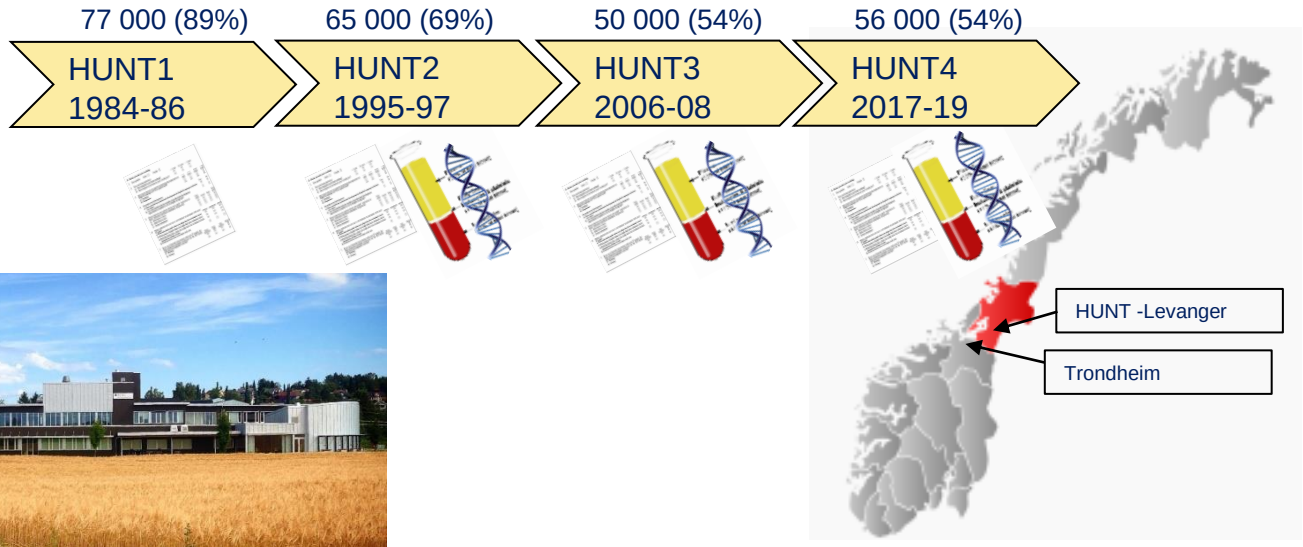
Content

- Who are the participants?
- What data are available?
- Strengths and weaknesses
- How to get access to data
- Where to find out more

HUNT –Trøndelag Health Study

- Original study population: all adults in Nord-Trøndelag
- Longitudinal design

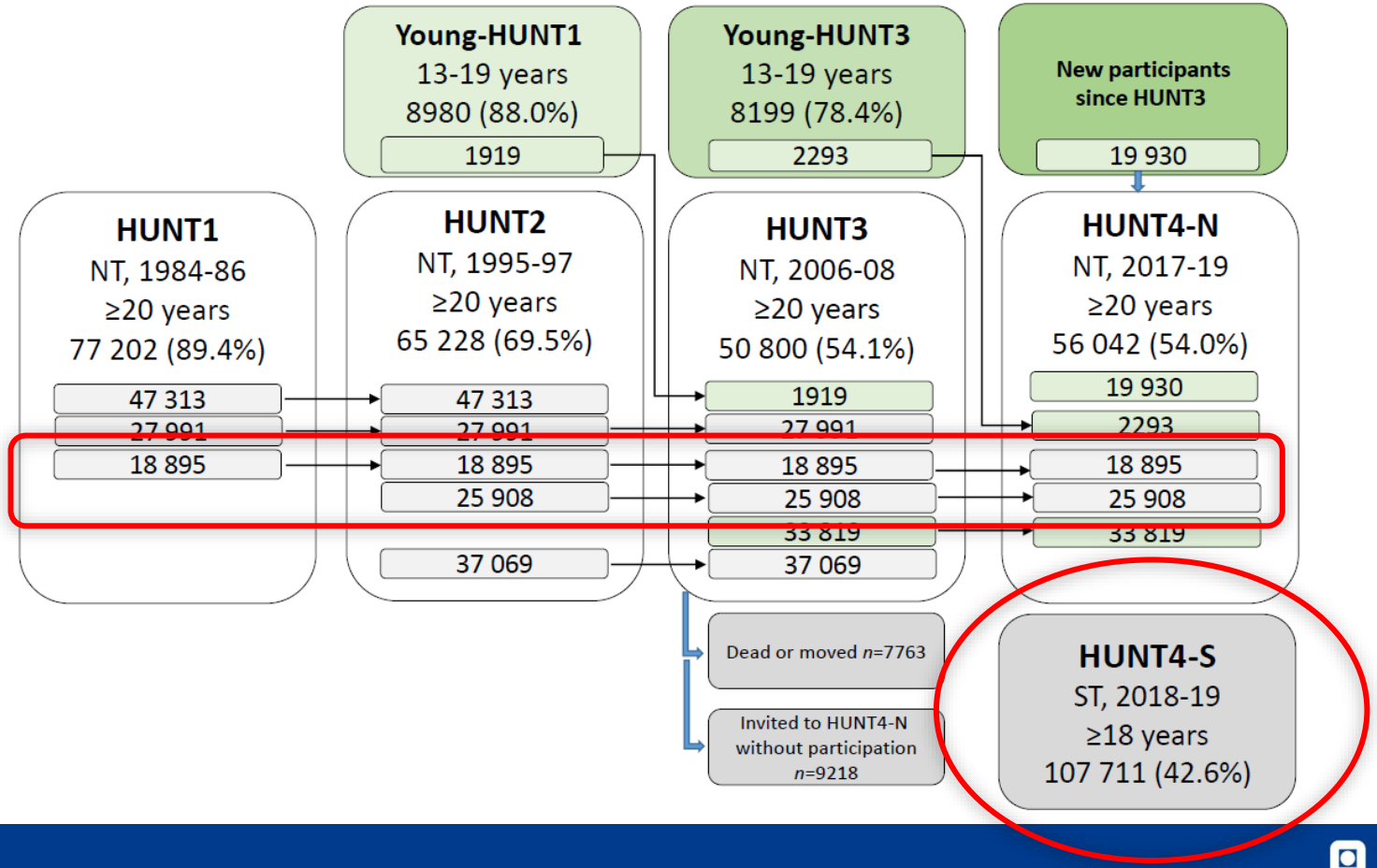


Young-HUNT

1984-86	1995-97	2000-01	2006-08	2017-19
	Young-HUNT1 (13-19 ys) 8980 (88%)	**Young-HUNT2** (16-19 ys) 2427 (77%)	**Young-HUNT3** (13-19 ys) 8199 (78%)	**Young-HUNT4** (13-19 ys) 8066 (76%)

HUNT
HELSEUNDERSØKELSEN I NORD-TRØNDELAG

NTNU
HUNT forskningssenter


Young-HUNT1
13-19 years
8980 (88.0%)
1919
Young-HUNT3
13-19 years
8199 (78.4%)
2293
New participants since HUNT3
19 930
HUNT1
NT, 1984-86
≥20 years
77 202 (89.4%)
47 313
27 991
18 895
HUNT2
NT, 1995-97
≥20 years
65 228 (69.5%)
47 313
27 991
18 895
25 908
37 069
HUNT3
NT, 2006-08
≥20 years
50 800 (54.1%)
1919
27 991
18 895
25 908
33 819
37 069
HUNT4-N
NT, 2017-19
≥20 years
56 042 (54.0%)
19 930
2293
18 895
25 908
33 819
Dead or moved n=7763
Invited to HUNT4-N without participation n=9218
HUNT4-S
ST, 2018-19
≥18 years
107 711 (42.6%)

Available data

- Extensive questionnaires (all HUNT surveys)
- Clinical examination (all HUNT surveys)
- Non-fasting blood sampling (adults, HUNT2-4)
- Linkage with registry data

Questionnaire data

- Main 4-page questionnaire
- Secondary questionnaire by age and sex
- Broad range of health behaviours, symptoms, diseases, quality of life etc
- Additional, disease specific questionnaires

HELSE OG DAGLIGLIV

1 Hvordan er helsa di nå?
☐ Dårlig ☐ Ikke helt god ☐ God ☐ Svært god

2 Har du noen langvarig (minst 1 år) sykdom, skade eller lidelse av fysisk eller psykisk art som nedsetter dine funksjoner i ditt daglige liv? Ja ☐ Nei ☐

Hvis ja:
Hvor mye vil du si at dine funksjoner er nedsatt?

	Litt nedsatt	Middels nedsatt	Mye nedsatt
Er bevegelseshemmet	☐	☐	☐
Har nedsatt syn	☐	☐	☐
Har nedsatt hørsel	☐	☐	☐
Hemmet pga. kroppslig sykdom.	☐	☐	☐
Hemmet pga. psykisk sykdom	☐	☐	☐

3 Har du kroppslige smerter nå som har vart mer enn 6 måneder? Ja ☐ Nei ☐

4 Hvor sterke kroppslige smerter har du hatt i løpet av de siste 4 uker?
Ingen ☐ Meget svake ☐ Svake ☐ Mode-rate ☐ Sterke ☐ Meget sterke ☐

5 I hvilken grad har din fysiske helse eller følelses-messige problemer begrenset deg i din vanlige sosiale omgang med familie eller venner i løpet av de siste 4 uker?
Ikke i det hele tatt ☐ En del ☐ Litt ☐ Mye ☐ Kunne ikke ha sosial omgang ☐

HELSETJENESTER

6 Har du i løpet av de siste 12 måneder vært hos:

	Ja	Nei
Fastlege/allmennlege	☐	☐

SYKDOMMER OG PLAGER

	Ja	Nei
8 Har du hatt noe anfall med pipende eller tung pust de siste 12 måneder?	☐	☐
9 Har du noen gang de siste 5 år brukt medisiner for astma, kronisk bronkitt, emfysem eller KOLS?	☐	☐
10 Bruker du, eller har du brukt, medisin mot høyt blodtrykk?	☐	☐

11 Har du, eller har du noen gang hatt, noen av disse sykdommene/plagene: *(Sett ett kryss pr. linje)*

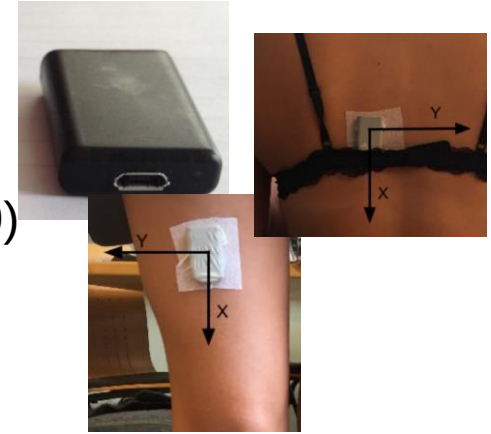
	Ja	Nei	Hvis ja, hvor gammel var du **første** gang? *Eksempel:* 3 4	
Hjerteinfarkt	☐	☐		år gammel
Angina pectoris (hjertekrampe)	☐	☐		år gammel
Hjertesvikt	☐	☐		år gammel
Annen hjertesykdom	☐	☐		år gammel
Hjerneslag/hjerneblødning	☐	☐		år gammel
Nyresykdom	☐	☐		år gammel
Astma	☐	☐		år gammel
Kronisk bronkitt, emfysem, KOLS	☐	☐		år gammel
Diabetes (sukkersyke)	☐	☐		år gammel
Psoriasis	☐	☐		år gammel
Eksem på hendene	☐	☐		år gammel
Kreftsykdom	☐	☐		år gammel
Epilepsi	☐	☐		år gammel
Leddgikt (reumatoid artritt)	☐	☐		år gammel
Bechterews sykdom	☐	☐		år gammel
Sarkoidose	☐	☐		år gammel
[illegible]	☐	☐		år

Clinical examination

- Blood pressure, heart rate
- Height, weight
- Waist & hip circumference (HUNT2-4)
- Additional measurements in subsamples: VO2 max, echocardiography, audiometry, bone mineral density, spirometry, dental health …

HUNT4 – new elements in the clinical examination and sampling

- Body composition (InBody 770)
- 1-week Axivity accelerometer recording (n=31000)
- 70+: Cognitive testing (MoCA)
- Food frequency questionnaire (n=5000)
- Fecal sampling – also in domestic animals
- A range of ancillary studies



Analyses in non-fasting blood samples

- Total and HDL cholesterol, triglycerides
- Glucose (HUNT2-3)
- HbA1c (HUNT4)
- Creatinine
- Thyroid function (HUNT2-4)
- CRP
- Iron/TIBC (HUNT2)
- Hemoglobin, blood cell counts (HUNT4)
- Troponin I (HUNT2-4)
- PEth (HUNT4)
- Coeliac serology (HUNT4)
- etc

Large-scale omics analyses

Genomics

Infinium Human Core Exome (Illumina) – 604 000 genome wide SNPs – incl 60 000 custom content, collaboration with the University of Michigan

70 000 participants of HUNT2/HUNT3, 19 000 additional participants of HUNT4

Whole genome sequencing

2200, low coverage (4-6x)

Proteomic

Somascan (Somalogic) – an aptamer-based protein assay (5000 proteins)

- 3500 c/c - to predict risk for secondary CVD-events (JAMA 2016)
- 1400 c/c - VTE (to be analyzed by Q4-2021)
- 1000 c/c – AAA (to be analyzed by Q4-2021)

Metabolomics

Nightingale - 220 lipid-based metabolites/NMR

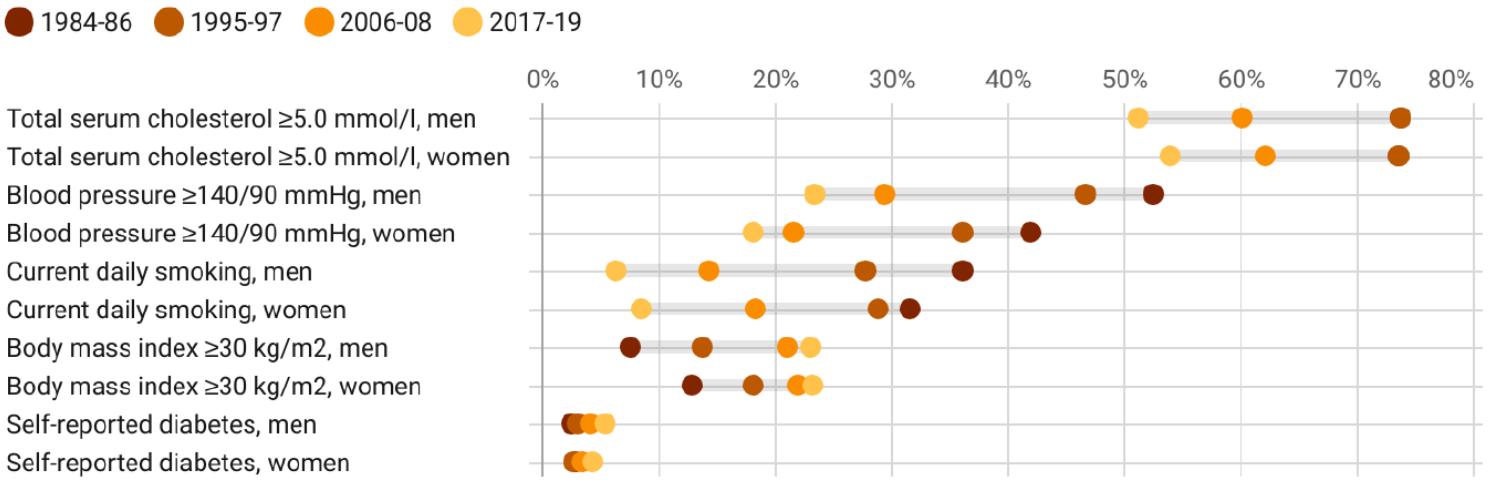
- 20 000 HUNT3 participants, analyses ongoing, University of Bristol

Stored samples

- Storage at -80°C in HUNT Biobank
- Serum, DNA (HUNT2-4)
- RNA (HUNT3)
- Urine (subsamples, HUNT2-4)
- Saliva (n=17 000, HUNT4)
- Feces (n=13 000, HUNT4)

Strengths

- Very longitudinal design


1984-86
1995-97
2006-08
2017-19
0%
10%
20%
30%
40%
50%
60%
70%
80%
Total serum cholesterol ≥5.0 mmol/l, men
Total serum cholesterol ≥5.0 mmol/l, women
Blood pressure ≥140/90 mmHg, men
Blood pressure ≥140/90 mmHg, women
Current daily smoking, men
Current daily smoking, women
Body mass index ≥30 kg/m2, men
Body mass index ≥30 kg/m2, women
Self-reported diabetes, men
Self-reported diabetes, women

Strengths

- Very longitudinal design
- Registry linkages
- Linkage to hospital diagnoses (1987-)

Project-specific

- Relatively high participation
- Within-family data

nature COMMUNICATIONS

ARTICLE

https://doi.org/10.1038/s41467-020-17117-4 OPEN

Check for updates

Avoiding dynastic, assortative mating, and population stratification biases in Mendelian randomization through within-family analyses

Ben Brumpton et al.#

NATURE COMMUNICATIONS | (2020)11:3519 | https:/,

Epidemiology/Population

Hypertension in Pregnancy and Offspring Cardiovascular Risk in Young Adulthood

Prospective and Sibling Studies in the HUNT Study (Nord-Trøndelag Health Study) in Norway

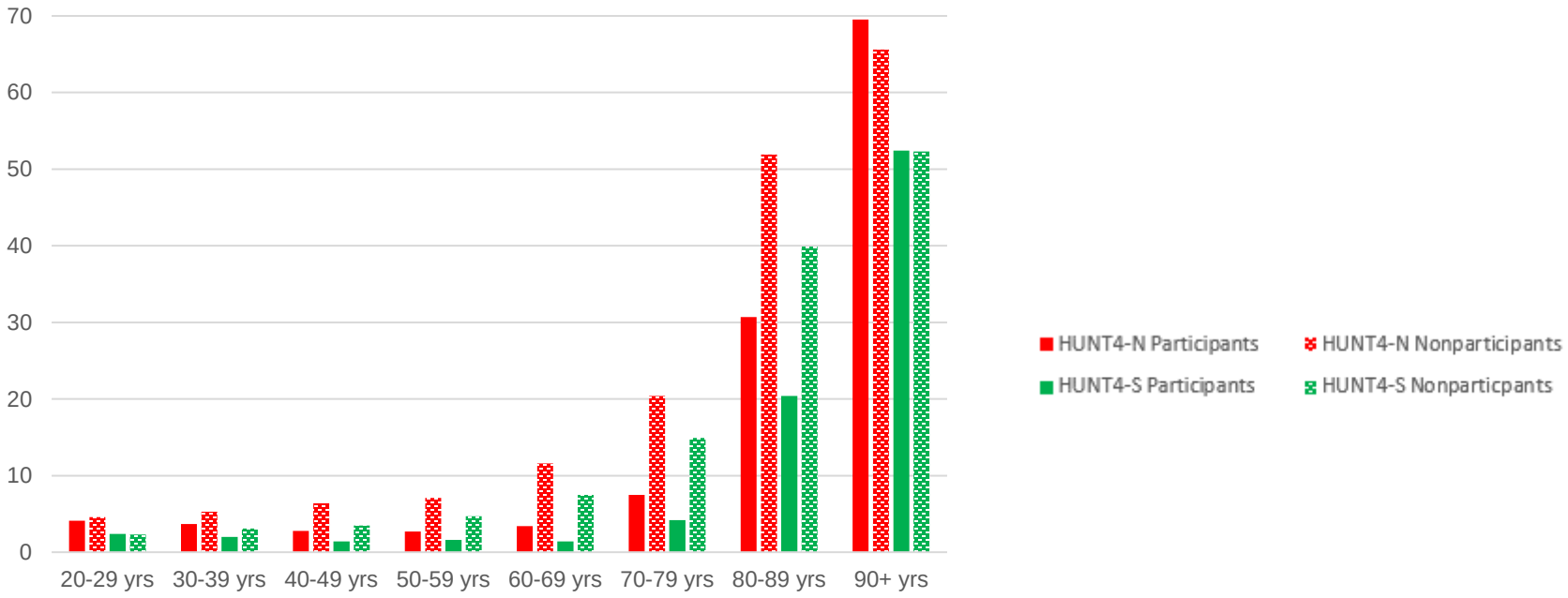
Ingvild V. Alsnes, Lars J. Vatten, Abigail Fraser, Johan Håkon Bjørngaard, Janet Rich-Edwards, Pål R. Romundstad, Bjørn O. Åsvold

Hypertension. 2017;69:591-598.

Weaknesses

- Possibilities for selection bias – despite good overall participation
  - Nonparticipants less healthy

Percentage using home nursing, women

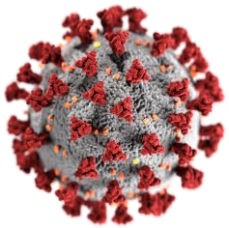


Percentage of people using home nursing in 2017 (Nord-Trøndelag) / 2019 (Sør-Trøndelag).
Data source: IPLOS, Norwegian Registry of Primary Health Care

Weaknesses

- Possibilities for selection bias – despite good overall participation
  - Nonparticipants less healthy
- No large cities
  - But Trondheim included in HUNT4-S
- Few participants of non-European ancestry

HUNT COVID



Questionnaire to all adult HUNT4 participants
Questionnaire to all adolescents aged ≥16 ys

Nord-Trøndelag: clinical exam with weight, serum sampling:
SARS CoV-2 serology ++

Sør-Trøndelag ?

Data collection until 2023 – still possible to suggest additions
(PI: Kristian Hveem)

HUNT Research Centre, Levanger:

HUNT administration
HUNT Biobank
HUNT Databank
Many HUNT researchers

Department of Public Health and Nursing, Trondheim:

HUNT Cloud
K.G. Jebsen Center for Genetic Epidemiology
Many other HUNT researchers

How to find out more or apply for data?

- Website: ntnu.no/hunt – ntnu.edu/hunt
- Access to HUNT data: https://www.ntnu.edu/hunt/data
- Variable overview: https://www.ntnu.edu/hunt/databank

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Variables per page

20

Surveys 2 | Variable group

HUNT3

Show data from these stu

HUNT3 Large Predators

HUNT3 Baseline

HUNT3 Alternative Medicine Study

HUNT3 Bone Densitometry

HUNT3 Cancer Study

https://hunt-db.medisin.ntnu.no/hunt-db/variable/3688

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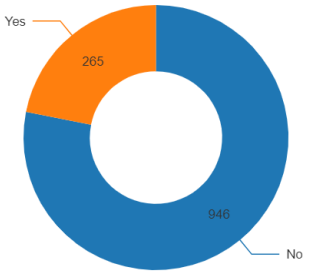
Variable choices

All variable choices and the number of respondents are shown in the chart and the table below



№	N	%	Text	English text
0	946	78.12%	Nei	No
1	265	21.88%	Ja	Yes

Study part

HUNT3 Large Predators Questionnaire

PASSWORD

the study

SETTINGS

n

1 211

n

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stionnaire

298

Large predators Threat

HUNT3 Large Predators Questionnaire

294

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International Journal of Epidemiology 2013;**42**:968–977
doi:10.1093/ije/dys095

COHORT PROFILE

Cohort Profile: The HUNT Study, Norway

S Krokstad,[1,2]* A Langhammer,[1] K Hveem,[1] TL Holmen,[1] K Midthjell,[1] TR Stene,[1] G Bratberg,[1,2] J Heggland[1] and J Holmen[1]

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International Journal of Epidemiology 2014;**43**:536–544
doi:10.1093/ije/dys232

COHORT PROFILE

Cohort profile of the Young-HUNT Study, Norway: A population-based study of adolescents

Turid Lingaas Holmen,[1]* Grete Bratberg,[1,2] Steinar Krokstad,[1,2] Arnulf Langhammer,[1] Kristian Hveem,[1] Kristian Midthjell,[1] Jon Heggland[1] and Jostein Holmen[1]

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CSH Cold Spring Harbor Laboratory BMJ Yale

Comment on

Cohort Profile Update: The HUNT Study, Norway

Bjørn Olav Åsvold, Arnulf Langhammer, Tommy Aune Rehn, Grete Kjelvik, Trond Viggo Grøntvedt, Elin Pettersen Sørgjerd, Jørn Søberg Fenstad, Oddgeir Holmen, Maria C Stuifbergen, Sigrid Anna Aalberg Vikjord, Ben M Brumpton, Håvard Kjesbu Skjellegrind, Pernille Thingstad, Erik R Sund, Geir Selbæk, Paul Jarle Mork, Vegar Rangul, Kristian Hveem, Marit Næss, Steinar Krokstad

doi: https://doi.org/10.1101/2021.10.12.21264858

This article is a preprint and has not been certified by peer review [what does this mean?]. It reports new medical research that has yet to be evaluated and so should *not* be used to guide clinical practice.

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Posted October 29, 2021.

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