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Tidsskriftet utgis vanligvis med ett eller to regulære temanummer pr. år. I tillegg publiseres et supplement med sammendrag fra Norsk forening for epidemiologis årlige konferanse. Fra 2023 utgis dette supplementet kun digitalt, ikke på papir.

DEN 31. NORSKE EPIDEMIOLOGIKONFERANSEN

BERGEN (RADISSON BLU ROYAL HOTEL), 29.–30. OKTOBER 2025

The 29th Norwegian Conference on Epidemiology

Transforming epidemiology with AI

Bergen, 29th-30th October 2025

The Norwegian Epidemiological Association (NOFE), and the local organizing committee for the NOFE 2023 conference warmly welcomes you to Bergen and the 31st NOFE conference.

Over two days, this conference will cover the topics "Transforming epidemiology with AI" with plenary sessions and panel discussions. A big thank you to Ass. Prof. Adam Hulman (Aarhus University), Ass. Prof. Tibor V. Varga (University of Copenhagen), Prof. Kerstin Bach (NTNU) and Prof. Jahn Frederik Frøen (University of Oslo), as well as all chairs and moderators, for your contributions.

In addition, more than 80 participants will present abstracts of the most recent research in a variety of epidemiological fields in parallel and poster presentations. Dear presenters, thank you for completing the conference program by updating us on modern research, and to moderators, for facilitating fruitful discussions.

Our aim is that all participants at the conference gain a greater understanding of epidemiology methods and education, insight into new research and find cooperative opportunities.

Enjoy the conference!

The NOFE Board
&
The organizing committee for the NOFE 2025 conference

Ingeborg Forthun, Christian Magnus Page, Rachel Bedenis Forster, Jenny Linnea Victoria Lindroos, Aditi Singh, Linn Marie Sørbye, Yeneabeba Tilahun Sima, and Shoaib Hassan

The 31st Norwegian Conference on Epidemiology

Bergen, 29th–30th October 2025

Abstracts

A: Reproductive epidemiology

A1

Severe pregnancy complications and the likelihood of continued reproduction

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Introduction: Complications during a first pregnancy have been shown to influence the likelihood of subsequent birth, due to fear of experiencing a recurrent complication or to underlying factors that may be causally related to both the complications and subfertility. Infant survival may also influence these associations. We therefore wanted to evaluate the association of severe pregnancy complications in a first pregnancy with the likelihood of a subsequent birth, and whether infant survival modifies such an association.

Aims: This study aims to investigate the impact of severe pregnancy complications (i.e. placental abruption, HELLP syndrome, eclampsia, preeclampsia with delivery <34 weeks, small for gestational age (<2.5th percentile), preterm birth (<32 weeks) and severe postpartum hemorrhage) in a first pregnancy on the likelihood of continued reproduction.

Methods: We used data from the Medical Birth Registry of Norway linked with the National Education Database and included 356,088 mothers whose first pregnancy was between 1999 and 2013. Follow-up for potential subsequent births was to 2020. Hazard ratio (HR) estimates with 95% confidence intervals were retrieved from Cox proportional hazards model.

Results: Mothers with first pregnancies affected by any severe complications had a significant decrease in subsequent births (adjusted HR [aHR] 0.90, 95% CI 0.88-0.91) compared to mothers whose first pregnancies were unaffected. When stratified by the child's one-year survival, mothers who experienced any severe complications in their first pregnancy and whose infants survived showed a reduction in subsequent births (aHR 0.86, 95% CI 0.84-0.87) compared to the reference group of women without any severe complications whose first birth also survived. However, exposed mothers with infants that did not survive appeared to have a 2-fold increase in subsequent births (aHR 2.23, 95% CI 2.08-2.38).

Conclusions: Mothers that experience any severe complication in their first pregnancy are less likely to have a subsequent birth, but infant survival modifies the association.

A2

Polygenic scores for dizygotic twinning: Insights into the genetic architecture of female fertility

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Introduction: Natural dizygotic twinning (DZT) results from hyper-ovulation and is an indicator of female fertility. However, some traits linked to DZ twinning are also associated with infertility. We examined the relationship between DZT and female (in)fertility using recent GWAS findings.

Methods: We investigated the genetic architecture of DZT and compared polygenic scores (PGS) for DZT between mothers of naturally conceived DZ twin pregnancies and mothers who required fertility treatments (MAR) in the Netherlands Twin Register (NTR) and the Norwegian Mother, Father, and Child Cohort Study (MoBa). We also calculated genetic correlations between DZT and seven fertility related traits.

Results: DZT has a low polygenicity, with only 0.20% of SNPs estimated to have a nonzero effect. The DZT PGS explains 1.6% of variance in DZT liability, and we observe an odds ratio of 2.29 between the first and the tenth PGS deciles. The DZT PGS distinguishes between mothers of naturally conceived pregnancies and mothers who received MAR and is associated with a shorter time to pregnancy in mothers of singletons. The lowest PGSs were observed for mothers who received hormonal ovulation induction, indicating maternal fertility issues. DZT showed genetic correlations with anovulatory infertility (rg = - 0.698) and PCOS (rg = - 0.278), and endometriosis (rg = 0.279).

Conclusion: Female fertility appears to exists on a genetic spectrum, with anovulation/infertility at one end and DZT at the other. Results suggest that the DZT PGS can be of added value to evaluate female fertility and be incorporated in clinical practice in the future.

A3

Impact of birthweight and gestational age on fecundability and the use of assisted reproductive technologies

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Introduction: Studies indicate that the quality of the intrauterine environment during pregnancy may influence the offspring's future reproductive health. This could occur through impaired gonadal development and disrupted hormonal patterns in adulthood.

Aims: We aimed to assess whether low birth weight and preterm birth affect reproduction later in life.

Methods: We used proportional probability regression to assess fecundability (the likelihood of conceiving within a given menstrual cycle) according to own birth weight and gestational length in 60,677 women and 45,560 men in the Norwegian Mother, Father and Child Cohort Study (MoBa). Using logistic regression, we also examined the relationships between birth weight and gestational length and the use of assisted reproductive technologies (ART; 575,935 women and 507,449 men) in the Medical Birth Registry of Norway (MBRN).

Results: Women born with low birth weight (<2500 g) had a lower fecundability (fecundability ratio [FR] 0.94, 95% confidence interval [CI] 0.91-0.98). We also observed a lower fecundability if women were born preterm (<37 weeks; FR 0.96, 95% CI 0.92-0.99) or postterm (>42 weeks; FR 0.94, 95% CI 0.91-0.98). We found no associations between birth weight or gestational length and fecundability in men. We found a lower likelihood of using ART in women born with low birth weight (OR 0.92, 95% CI 0.87-0.97) and women born preterm (OR 0.90; CI 0.85-0.95), but a higher likelihood in men with low birth weight (OR 1.09, 95% CI 1.02-1.15).

Conclusions: We identified modest associations between low birth weight, preterm birth and postterm birth with lower fecundability in women. However, the results for ART use were conflicting.

A4

Incidence and risk factors of postpartum maternal sepsis and other postpartum infections in Norway, 2012-2020: An epidemiologic cohort study

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Introduction: There are few epidemiological studies on obstetric infections in the Nordic countries.

Aims: To assess the incidence and risk factors of postpartum maternal sepsis and other postpartum infections in Norway.

Methods: We included all births in Norway 2012-2020, using linked data from the Medical Birth Registry of Norway, the Norwegian Patient Registry, and Statistics Norway. We defined two main outcomes: endometritis/puerperal sepsis (O85, ICD-10) and other postpartum infections (O86, ICD-10). Puerperal sepsis could not be assessed separately, as the ICD-10 does not differentiate puerperal sepsis from endometritis without sepsis. Associations between risk factors and outcomes were estimated using relative risks (RR) with 95% confidence intervals (CI) from log-binomial regression. Covariates varied between models and mediators were not included. Analyses were clustered on mothers. Pregnancy- and delivery-related factors were closely related within groups. Accordingly, we ran models including specific factors alone but also with adjustment for all other factors within the groups.

Results: Among 516 874 deliveries, 5 942 cases (1.15%) of endometritis/puerperal sepsis (O85) and 7 484 (1.45%) of other postpartum infections (O86) were identified. There was an increase ($p<0.001$) in the incidence of endometritis/puerperal sepsis (O85) over time (2012: 0.93% / 2020: 1.38%). After adjusting for all covariates, delivery-related factors demonstrated the strongest associations with both outcomes, especially emergency cesarian section (aRR_{O85} 3.3, 95% CI 3.1-3.5 / aRR_{O86} 5.5, 95% CI 5.2-5.9) and postpartum hemorrhage (aRR_{O85} 3.2, 95% CI 3.0-3.5 / aRR_{O86} 2.1, 95% CI 1.9-2.2). Prepregnancy- and pregnancy-related factors were also associated with the outcomes, such as nulliparity (aRR_{O85} 1.6, 95% CI 1.5-1.7 / aRR_{O86} 1.9, 95% CI 1.8-2.0) and multiple pregnancy (aRR_{O85} 1.9, 95% CI 1.6-2.2 / aRR_{O86} 2.0, 95% CI 1.8-2.3). Some sociodemographic factors also displayed weaker associations with the outcomes, e.g. single mother (aRR_{O85} 1.2, 95% CI 1.1-1.4 / aRR_{O86} 1.3, 95% CI 1.2-1.4). Maternal age and smoking were not associated with the outcomes.

Conclusions: Postpartum infections are common with increasing rates of endometritis/puerperal sepsis (O85). For all postpartum infections, delivery-related factors demonstrated the strongest associations, followed by pregnancy-related and sociodemographic indicators. Revision of the coding system (ICD) is warranted to enable a clear differentiation between puerperal sepsis and endometritis.

A5

Physical and cognitive performance by gestational age in young men and women: A national population-based study

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Introduction: Low gestational age (GA) is associated with an increased risk of neurodevelopmental impairments, reduced physical activity levels and a higher risk of non-communicable diseases. Sex differences in long-term outcomes associated with GA are insufficiently investigated.

Aims: Investigate if associations between GA and health outcomes, physical and cognitive performance differs between young men and women.

Methods: Men and women registered in the Medical Birth Registry of Norway (MBRN, 1997-2002) were linked to the Norwegian Armed Forces Health Registry (NAFHR, 2014-2022). Outcomes were weight, height, body mass index (BMI), heart rate (HR), systolic- and diastolic blood pressure (SBP, DBP). Results from tests of muscular strength, aerobic fitness and cognitive ability were converted to scores from 0-9 (best). Linear regression models were used to examine sex-specific trends and differences by GA, categorized into: 22-32, 33-36, and 37-44 weeks. We adjusted for year of birth, maternal age, education level, marital status and parity.

Results: Of 348,348 live-born registered in MBRN, 107,486 were registered in NAFHR (17-19 years of age). After excluding missing GA, implausible birthweight and multiple births, the study sample consisted of 59,996 (92.9%) men and 39,511 (92.1%) women. Mean weight and height increased with GA in both sexes (weight: men 71.2 to 75.3 kg, women 61.0 to 64.2 kg; height: men 177.1 to 181.1 cm, women 163.3 to 167.7 cm). SBP decreased with increasing GA for both sexes (men 131.8 to 129.2 mmHg, women 126.2 to 123.5 mmHg), while DBP decreased with increasing GA only in women (men 75.2 to 74.5 mmHg, women 76.4 to 75.3 mmHg; p-interaction = 0.12). Muscular strength and cognitive ability increased with GA in men, not in women (muscular strength: men 5.4 to 5.8 units, women: 3.5 to 3.4 units; cognitive ability: men 5.1 to 5.5 units, women 5.1 to 5.0 units; p for interaction = 0.006 and <0.001). GA was not associated with aerobic fitness, BMI or HR.

Conclusions: GA was positively associated with height and weight, and inversely associated with SBP in both sexes. Cognitive ability and muscular strength improved with GA only in men, while DBP slightly decreased with GA only in women.

A6

Twins on board: How does carrying two affect physical activity levels?

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Introduction: Few longitudinal population-based studies have described physical activity patterns in women pregnant with twins, and studies on physical activity including the period after birth are lacking. We need knowledge of physical activity patterns in women pregnant with twins to develop physical activity recommendations.

Aims: To describe stability and change in leisure-time physical activity (LTPA) from pre-pregnancy, through pregnancy and up to 18 months after birth in women pregnant with twins and compare patterns of LTPA by parity.

Methods: We included 1,796 women pregnant with twins from the Norwegian Mother, Father and Child Cohort Study. LTPA was self-reported using a validated questionnaire in pregnancy weeks 17 and 30 and six and 18 months after birth. The women reported frequency of 14 different types of physical activities. Participants were eligible if they had a twin pregnancy, returned the first questionnaire, and reported LTPA at least once. To identify latent classes, we fitted a generalized latent class model including a quadratic term and with intercept and slope varying across individuals. We report estimated latent class-specific mean trajectories of LTPA for the total sample and stratified by parity.

Results: Two latent classes were identified: stable low-to-moderate LTPA (76.6%) and high LTPA (23.4%). In the high LTPA class, levels of LTPA decreased from pre-pregnancy to gestational week 30. LTPA increased after birth, but not to pre-pregnancy levels. The highly active class had a higher proportion of nulliparous women (59.9%), while the low-to-moderately active class had a higher proportion of multiparous women (53.9%).

Conclusions: This is the first population-based study exploring longitudinal LTPA in women pregnant with twins. Despite the heavy burden associated with twin pregnancy, we observed relatively stable moderate to high levels of LTPA from pre-pregnancy, through pregnancy, and up to 18 months after birth. The potential consequences of physical activity in twin pregnancy on maternal and fetal health remain unexplored, and further research on physical activity in twin pregnancies are needed.

B: Bone health

B1

Incidence of forearm fracture in adulthood among second-generation immigrants in Norway

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Introduction: Forearm fractures are common in the general Norwegian population. Fracture incidence is usually lower among first-generation immigrants compared to ethnic Norwegians, but the risk among second-generation immigrants (born in Norway) has not been previously studied.

Aims: The aims of our study were 1) to compare the incidence of forearm fracture in second-generation immigrants to that of the ethnic Norwegian population and first-generation immigrants, and 2) to assess whether the relative risk is different when stratifying on age below and above 50 years.

Methods: In this register-based cohort study, forearm fractures (ICD 10 code S52) sustained during 2008-2018 in individuals ≥20 years were identified from the Norwegian Patient Registry. From Statistics Norway, we collected information on immigrant background: First- and second-generation immigrants, ethnic Norwegians born in Norway and ethnic Norwegians born abroad, social characteristics, degree of urbanization (0-1) and health region. Age-standardized incidence rates were obtained by direct standardization. A negative binomial regression model was used to estimate incidence rate ratios (IRRs) with 95% confidence intervals (CI).

Results: A total of 159,065 forearm fractures occurred in 42,469,774 person-years. In second-generation immigrants with two foreign-born parents (2nd gen2), there were N=452 forearm fractures, and in second-generation immigrants with one foreign-born parent (2nd gen1), there were N=3236 fractures. The age-standardized incidence rate of 2nd gen2 was 33 per 10,000 person-years, 35 in 2nd gen1, and 38 in the ethnic Norwegian population (reference). The IRR for 2nd gen2 was 0.64 (95% CI 0.58-0.71), whereas the IRR of 2nd gen1 was 0.93 (95% CI 0.89-0.96) (adjusted for age, gender, marital status, education, urbanization, health region and calendar year). The corresponding IRR for first-generation immigrants was 0.79 (95% CI 0.77-0.81). Relative risk estimates remained the same after stratifying on age, except for individuals in the 2nd gen2 >50 years where the association was attenuated (IRR 0.94, 95% CI 0.80-1.09)

Conclusions: Second-generation immigrants have an overall lower risk of forearm fracture compared to ethnic Norwegians; this incidence is lowest among those born in Norway with both parents being foreign-born. However, the older age group does not seem to have a lower risk compared to ethnic Norwegians.

B2

Is there an association between birth characteristics and bone mineral density and content in young adults? The HUNT Study, Norway

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Introduction: Peak bone mass is typically reached in young adulthood and is a key determinant of future fracture risk. Birth characteristics such as birth weight, gestational age, and ponderal index reflect fetal growth and may influence bone mineral density (BMD) and bone mineral content (BMC) later in life. However, few large studies have examined these associations in young adults.

Aim: To investigate the association of birth characteristics with bone mineral density (BMD) and bone mineral content (BMC) in young adults.

Methods: Overall, 3,174 participants in the 3rd (2006-2008) and 4th (2017-2019) survey of the HUNT Study were linked with the Medical Birth Registry of Norway. Bone densitometry was obtained using dual-energy X-ray absorptiometry (DXA). Linear regression was used to estimate mean differences with 95% confidence intervals (CIs) in BMD and BMC according to birth characteristics, adjusted for sex, birth year, age at bone densitometry, maternal age, and maternal morbidity.

Results: Mean age at bone densitometry was 34.2 years (SD 8.4). The mean BMD for all participants was 0.971 g/cm² and 5.398 g for BMC. A standard deviation increase in ponderal index was associated with an increase of 0.024 g/cm² (95% CI 0.006-0.042) in BMD and 0.171 g (95% CI 0.048-0.293) in BMC. Similarly, a standard deviation increase in birth weight was associated with a 0.015 g/cm² (95% CI 0.009-0.022) increase in BMD and 0.146 (95% CI 0.112-0.181) for BMC. Individuals born large for gestational age (LGA) had a 0.023 g/cm² (95% CI 0.007-0.039) higher BMD and a 0.206 g (95% CI 0.098-0.313) higher BMC compared to those born appropriate for gestational age (AGA). For BMC, the adjusted mean difference was -0.298 g (95% CI -0.469, -0.127) and -0.142 g (95% CI -0.235, -0.049) for individuals born with a birth weight below 2.5 kg and small for gestational age (SGA), respectively.

Conclusion: Ponderal index, birth weight, and gestational age were positively associated with BMD and BMC in young adults.

B3

The influence of height on the risk of hip fracture differs by fracture type: A NOREPOS study utilizing data from The Norwegian Hip Fracture Register

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Introduction: Increased body height is a risk factor for hip fracture. One of several proposed explanations for this is that a longer femoral neck will increase the forces applied to the femoral neck during a fall due to a longer moment arm. On average, taller people have a longer femoral neck, and a longer femoral neck results in a longer moment arm.

Aims: Based on this, we hypothesized that body height is more strongly associated with femoral neck fractures compared to per-trochanteric fractures.

Methods: We used data from the population-based Cohort of Norway (CONOR) 1994-2002 linked to the Norwegian Hip Fracture Register with data on hip fractures treated at Norwegian hospitals in the period 2005-2019, including detailed information on type of fracture which we categorized into femoral neck fractures and the combined group of per-trochanteric and sub-trochanteric fractures.

In our analyses, we used data from men and women aged 50-79 at the time of the CONOR examination, who previously had their height and weight measured during a nationwide tuberculosis screening program during 1963 to 1975 (at age 20-45 years, available for approximately three-quarters of the CONOR participants). As age-related height loss is expected to be more pronounced in those with osteoporosis and could thus confound the association between height and hip fracture, we used height measured at the tuberculosis screening in our analyses. Data were analyzed with Cox proportional hazard regression adjusting for age and county.

Results: During follow-up, 2,458 hip fractures were registered in 31,194 study participants. In men, 10cm increase in body height was associated with a hazard ratio (HR) 1.50 (95% confidence interval [CI] 1.30-1.74) for femoral neck fractures and a HR 1.28 (95% CI 1.04-1.57) for per/sub-trochanteric fractures. The corresponding figures in women were HR 1.40 (95% CI 1.26-1.57) for femoral neck fractures and HR 1.20 (95% CI 1.05-1.38) for per/sub-trochanteric fractures.

Conclusions: In accordance with our hypothesis, increasing body height was more strongly associated with femoral neck fractures compared to per/sub-trochanteric fractures.

B4

Parity, age at first birth, breastfeeding and risk of major osteoporotic fractures in middle-aged women: The HUNT Study

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Introduction: Reproductive factors may influence long-term bone health through hormonal and lifestyle changes, yet reported associations between reproductive history and fracture risk are inconsistent. Understanding this relation has become increasingly important as reproductive patterns have changed considerably over recent decades.

Aims: To investigate if parity, age at first birth, and lifetime breastfeeding duration is associated with the risk of major osteoporotic fractures (MOF) in Norwegian women.

Methods: This population-based cohort study analyzed data on 41,275 women aged ≥45 years from the Trøndelag Health Study (HUNT) linked with the Medical Birth Registry of Norway and hospital-based fracture records. Cox proportional hazards regression with age as time scale estimated adjusted hazard ratios (HRs) with 95% confidence intervals (CIs) for MOF (i.e., hip, spine, proximal humerus, or distal forearm).

Results: During ~1 million person-years, 22,460 MOFs were identified, of which 9,644 were hip fractures. Compared to women with two births (reference), women with four births had lower fracture risk (HR 0.90, 95% CI 0.84-0.97). Each additional birth was associated with a modest risk reduction (HR 0.98, 95% CI 0.96-0.99). Women with first birth at age ≥30 years had a HR of 0.92 (95% CI 0.85-1.00) compared to women with first birth at age 20-24 years. Women with the longest breastfeeding duration (≥21 months) had a HR of 0.89 (95% CI 0.76-1.02) compared to those who never breastfed. Site-specific analyses revealed heterogeneous effects across different fracture types.

Conclusions: Higher parity, older age at first birth, and longer breastfeeding duration were associated with a modest reduction in the risk of MOF. These findings suggest that reproductive history may have lasting effects on skeletal health and could inform individualized fracture risk assessment in women.

B5

Incidence of proximal humerus fracture varies by country of origin and marital status

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Introduction: Proximal humerus fractures are common among older adults. Their incidence and sociodemographic risk factors have been insufficiently investigated.

Aims: The aims of our study were 1) to describe the incidence rates of proximal humerus fractures in Oslo, Norway and 2) to assess the impact of marital status, education level, and country of origin on proximal humerus fracture risk.

Methods: In this register-based closed cohort study, proximal humerus fractures (ICD-10 code S42.2) sustained during 2012-2022 in individuals born before 1952 and living in Oslo on 1 Jan 2012 were identified from the Norwegian Patient Registry. Information on marital status, education level, and country of origin (1: Norway, 2: European Union (EU)/European Economic Area (EEA), Great Britain, USA, Canada, Australia, New Zealand, 3: Europe outside EU/EEA, 4: All other countries) was retrieved from Statistics Norway. A Poisson regression model was used to estimate incidence rate ratios (IRRs) with 95% confidence intervals (CI). Age-adjusted incidence rates were obtained by direct standardization and restricted to individuals ≥70 years to include complete age cohorts for the entire time period.

Results: A total of 3,520 proximal humerus fractures (79% women) occurred in the study population (N=100,982). Overall incidence rates were 22 (95% CI 20-24) and 62 (95% CI 59-64) per 10,000 person years in men and women, respectively, and increased substantially with age. Individuals in all country-of-origin categories outside Norway had reduced risk of proximal humerus fracture compared to those of Norwegian origin (reference), with the lowest risk observed for the category “All other countries” (IRR 0.37 (95% CI 0.24-0.57) in men and IRR 0.49 (95% CI 0.38-0.65) in women). An IRR of 1.70 (95% CI 1.37-2.11) was found in unmarried compared to married men, with a corresponding IRR of 1.17 (95% CI 1.03-1.33) in unmarried versus married women. No educational gradient was found.

Conclusions: Individuals of Norwegian origin and those who were unmarried had the highest proximal humerus fracture risk. Identifying vulnerable groups at a high risk of humerus fracture will be relevant when planning future healthcare services.

B6

Risk of hip fracture in patients with type 2 diabetes treated with Glucagon-Like Peptide-1 Receptor Agonists (GLP-1ras) versus Dipeptidyl Peptidase 4 Inhibitors (DPP4i) in Norway: A registry-based comparative study

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Introduction: GLP-1RAs, which are used to regulate blood glucose in type 2 diabetes, also induce weight loss. Their use has surged dramatically in recent years. Rapid weight loss is associated with fracture risk. Furthermore, type 2 diabetes is an independent risk factor for hip fracture, with proposed mechanisms including inflammation, poor physical functioning and pharmacological treatments.

Aims: To compare the risk of hip fracture in patients with type 2 diabetes after starting treatment with GLP-1RAs and DPP4i, respectively.

Methods: We used data from the Norwegian Prescribed Drug Registry, the Norwegian Epidemiologic Osteoporosis Studies (NOREPOS) hip fracture database and Statistics Norway. We included incident users of GLP-1RAs or DPP4i aged 50+ years who had previously used metformin, had a diagnosis of type 2 diabetes as reimbursement code for their first GLP-1RA or DPP4i fill, and filled at least two prescriptions. We excluded those with a history of treatments implying advanced chronic kidney disease, any previous fill of thiazolidinediones (associated with osteoporosis), or fill of hypoglycemia-inducing antidiabetics (affecting fall risk) within three months before the first fill of GLP-1RA or DPP4i. We performed Cox proportional hazards regression with hip fracture as outcome and age as timescale, adjusted for calendar year (categorical) and comorbidity expressed by the Rx-Risk Comorbidity Index for the calendar year prior to initiation (splines). In the analysis reflecting intention-to-treat, all were followed from their second filling of the initiator drug to a hip fracture, emigration, death, or 31.12.2023, whichever occurred first, disregarding cumulative dose, change of medication, discontinuation, and other drug use.

Results: The study population included 23 605 GLP-1RA initiators (45% women) and 50 068 DPP4i initiators (38% women) during 2008-2023, with mean (SD) age 61.6 (8.8) years in GLP-1RA initiators and 65.7 (10.5) years in DPP4i initiators. During 346,079 person-years, 1,657 hip fractures occurred. Hazard ratios (95% confidence intervals) for hip fracture in GLP-1RA vs. DPP4i initiators were 0.70 (0.53, 0.92) in women and 0.98 (0.73, 1.31) in men.

Conclusions: In an intention-to-treat design, we found a statistically significant lower risk of hip fracture in women who started GLP-1RAs compared with DPP4i, but no difference in men.

C: Social inequality

C1

Tracking educational inequalities in cause-specific years of life lost: A nationwide burden of disease analysis, 1990–2021

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Introduction: Despite universal healthcare and free education, Norway continues to experience substantial educational inequalities in premature mortality. This study uses nationwide registry data and a burden of disease framework to estimate absolute and relative differences in cause-specific Years of Life Lost (YLLs) by educational attainment from 1990 to 2021.

Aims: To quantify absolute and relative educational inequalities in cause-specific premature mortality in Norway from 1990 to 2021 using YLLs.

Methods: We linked individual-level registry data to estimate cause-specific YLLs by educational attainment. We identified over 130 level-3 causes (based on the Global Burden of Disease definitions) in the Norwegian Cause of Death Registry. YLLs capture premature mortality by weighting deaths by both frequency and age at death. Own education was used from age 28 onward; parental education was used for individuals younger than 28. We calculated age-standardised YLL rates and assessed absolute and relative inequalities using the Slope and Relative Indexes of Inequality (SII and RII). Time trends were modelled using Poisson regression with splines. Analyses were stratified by sex.

Results: In 2021, Norwegians with low education had nearly double the age-standardised YLL rate compared to those with high education: 23,153 vs. 11,119 per 100,000 for males, and 16,007 vs. 8,382 for females. Inequalities followed a clear gradient across education groups. Ischaemic heart disease (IHD), COPD, lung cancer, self-harm, and colorectal cancer showed the largest absolute YLL gaps among males; for females, COPD, lung cancer, IHD, drug use, and stroke were the leading contributors. Trends in RII indicated widening relative inequalities across most causes since 1990—particularly for COPD, lung cancer, and drug use disorders. Absolute inequalities (SII) showed more complex patterns: decreasing overall for males, but increasing for females, with some evidence of recent reversal. Some causes, such as IHD, showed declining absolute gaps but increasing relative disparities. Drug use disorders demonstrated the highest RII values, especially among females.

Conclusions: Educational inequalities in premature mortality persist in Norway, with some overall reductions in absolute terms but varying trends by sex and cause. Applying a burden of disease framework offers a comprehensive approach for quantifying and monitoring educational inequalities in mortality over time.

C2

Mortality continuum in severe mental disorders: A population-based study across primary and specialist healthcare

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Introduction: Individuals with severe mental disorders are at increased risk of premature mortality. However, we lack understanding of how this mortality gap varies across different healthcare settings and socioeconomic backgrounds.

Aims: Thus, we aimed to estimate the impact of healthcare setting and socioeconomic position on mortality metrics in depression, bipolar disorder, and schizophrenia.

Methods: A cohort of all individuals living in Norway aged between 18 and 79 years on Jan 1, 2008, was followed until Dec 31, 2023. Information on severe mental disorders treated across specialist and primary healthcare, cause of death, and educational attainment was retrieved from nationwide registries. Life expectancy reductions stratified by healthcare-level (inpatient, outpatient specialist, primary) and educational attainment (university, high school, lower than high school) were calculated using the life years lost method.

Results: The cohort consisted of 3,193,359 individuals, including 29,371 with schizophrenia, 57,772 with bipolar disorder, and 673,994 with depression. The mortality gap was of an increasing magnitude from depression, through bipolar disorder, to the largest gap in schizophrenia. There was an overall pattern of larger life expectancy reductions among individuals engaged in inpatient healthcare compared to those treated in outpatient specialist healthcare, with the smallest life expectancy reductions among patients receiving primary healthcare only (e.g., conditioned life expectancy in men with schizophrenia and high school educational attainment engaged in inpatient healthcare was 71.41 years (95% CI 70.73-72.06), while it was 78.36 years (95% CI 76.90-79.91) for men with schizophrenia and high school educational attainment receiving primary healthcare only. This pattern was seen in women and men, all the disorders, and replicated across the socioeconomic strata. Individuals with lower educational attainment had larger life expectancy reductions across the total population and in all the patient groups with severe mental disorders.

Conclusions: Individuals with severe mental disorders face a mortality gap, which forms a continuum gradually increasing with the level of healthcare-need and socioeconomic disadvantage. The mortality pattern revealed in our study highlights the potential of further research on incorporating healthcare-level and socioeconomic position in prediction tools and healthcare strategies tailored for people with severe mental disorders.

C3

Between rights and restrictions

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Introduction: European countries have, over the last decades, encouraged and facilitated intra-European mobility. While many benefit from this freedom of movement, a subset of mobile EU citizens have limited or no access to health and social services, and some end up homeless in cities like Oslo in Norway. The combination of homelessness and continued mobility complicates efforts to assess health needs, clarify legal entitlements, and build trusting clinical relationships. For many, stable housing is a key social determinant to health, crucial for both assessment and delivery of adequate care. In the absence of a publicly provided shelter, a non-governmental organization in Oslo established V4, a 'long term' shelter for homeless migrants, which operated between 2019-2023.

Aims: This study aims to investigate the use of the 'long term' shelter V4 among homeless migrants.

Methods: We used a mixed methods approach. We collected and analysed the quantitative data from the registry of users at the shelter. Migrants were grouped in country of origin and sex. The main outcomes were reason for admission, rate of readmissions and length of stay. We used multinominal logistic regression to estimate the association between sex and reasons for admissions.

We then did semi-structured qualitative interviews with health and social workers at V4 and with those from low threshold facilities referring migrants to the shelter. The main qualitative analysing method used was an inductive text analysis of interviews. We transcribed interviews, coded the information and used reflexive thematic analyses.

Results: We found 140 migrants used the shelter with 1-10 stays per migrant over the five-year period**.** The migrants were aged 18 to 80 years (Mean 44.6, SD 12.4) and 63% were men. They originated from 25 different countries where 70% came from the European Union. The mean length of stay was 28.5 days (SD 24.4). The project provided services for people suffering from untreated chronic illnesses, recent surgeries, gender-based violence and social withdrawal, as well as victims of labor exploitation and human trafficking.

Conclusions: Through interdisciplinary collaboration and needs-based discretionary practices, V4 addressed acute health and social vulnerabilities where statutory services failed to respond.

C4

The rise in adolescent psychological distress: Perceived family economy, parental education and income. The Young HUNT study, 2006-2019

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Introduction: Self-reported psychological distress among adolescents has increased internationally the last two decades, particularly internalizing symptoms among girls. Socioeconomic factors are linked to mental health problems, and high-income countries report increased socioeconomic inequalities in adolescent mental health.

Aims: To investigate potential secular changes in associations between adolescent anxiety and depression symptoms, and several markers of socioeconomic status (SES); registry based parental household income and education level, and the adolescents' self-reported family financial situation.

Methods: A family linkage study using multilevel mixed-effects generalized linear model (meGLM) used on data from two Norwegian cross-sectional population-based health studies was applied. Adolescent (aged 13-19 years) anxiety and depression symptom level was assessed by a short version of the Hopkins Symptom Checklist (SCL-5) and family financial situation was self-reported in the Young HUNT3 (2006-2008, n=8199) and the Young HUNT4 Survey (2017-2019, n=8066). Parental anxiety and depression symptom level was assessed by the 14-item Hospital Anxiety and Depression rating Scale (total HADS score) in the HUNT3 (2006-2008, n=50 800) and the HUNT4 Survey (2017-2019, n=56 042). Both parents' income and educational level were collected from Statistics Norway (SSB).

Results: We found little or no support for an association, or a secular change in the association, between parental registry-based income and educational level with adolescent mean SCL-5 total score from 2006-08 to 2017-19. In contrast, adolescents that perceived their family financial stress worse than others, reported higher SCL-5 total score compared to those with self-perceived average financial stress (relative differences (RD)) ranged from 1.16 (95% CI 1.09-1.23) to 1.24 (95% CI 1.17-1.31)). We did not observe a secular change in these associations in the same time period. Adjustment for parental total HADS score did not change the estimates.

Conclusion: There was little evidence for an association, or a secular change in the association, between objective, registry-based SES markers and SCL-5 total score from Young-HUNT3 to Young-HUNT4. In contrast, self-perceived family financial stress was associated with 20-25% increased mean SCL-5 score in both genders. We suggest using more than one measure of SES when investigating socioeconomic inequalities in mental health.

C5

Violent crime and severe mental disorders: A 15-year study using Norwegian registry data

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Introduction: Violence is a global public health concern, accounting for 2.5% of global mortality. While people with severe mental disorders (i.e., schizophrenia spectrum and bipolar disorders) are not responsible for the majority of violent crimes, they are at increased risk of perpetration.

Aims: To improve understanding of the relationship between violent crime and severe mental disorders by investigating offending and re-offending patterns, as well as differentiating between different types of violent crimes.

Methods: Data used in this study is extracted from a new population-wide registry linkage (ForenPsych, N ≈ 9 million individuals), including diagnosis of mental disorders (Norwegian Patient Register), violent crime (Penal Sanctions), and sociodemographic factors (Statistics Norway). The study cohort included all citizens residing in Norway between 01.01.2008 to 31.12.2022, who were between 15 and 90 years old. For mental disorders, the following diagnosis were included: schizophrenia, schizotypal, and delusional disorder (F2x.x), bipolar episode and bipolar affective disorder (F30.x and F31.x), psychoactive substance use disorder (F1x.xx), personality disorder (i.e., paranoid, schizoid, dissocial, emotionally unstable, and histrionic; F60.0–F60.4), and hyperkinetic or conduct unspecified disorder (F90.x and F91.x). We performed descriptive analysis to examine lifetime presence of violent crime and violent re-offending in mental disorders, differentiating between crime types. Absolute risk and hazard ratios of violent crime were also estimated using cumulative incidence and Cox regression analysis.

Results: Violent crime was most often perpetrated by young men without mental disorders. Less severe violent offenses (e.g., threats, assault) were the most common for both offending and re-offending. Absolute risk over time and hazard ratios were elevated among persons with a mental disorder—especially, personality and schizophrenia spectrum disorders. Substance use disorder was present in the majority of perpetrators with severe mental disorders.

Conclusions: Having a severe mental disorder, especially in the schizophrenia spectrum, with concurrent substance use disorder constitutes a risk factor for violent offending modulated by age and sex. Our results indicate that focusing on treatment adherence and targeting substance use may contribute to a reduction of overall violent incidents.

C6

Use of health services in the handover period between adolescent and adult mental health services 2008-2021: A Norwegian register Study

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Introduction: Turning 18 years old represents a critical juncture for the use of mental health services for young people. The shift from Child and Adolescent Mental Health Services (CAMHS) to Adult Mental Health Services (AMHS) is often fraught with complexities, as it coincides with significant developmental, social, and educational milestones that can exacerbate existing mental health vulnerabilities. *Poorly managed shift between services often lead to service discontinuities, unmet needs, and disengagement from care*. This study explores health care service utilization trajectories in primary and specialized health care during the shift between CAMHS and AMHS, leveraging population-wide registry data to identify patterns of transitions in Norway.

Methods: This longitudinal registry-based cohort study included all 1,269,047 individuals aged 15.5–21 years in each calendar year from 2008 to 2011, estimating their health care utilization during this period. Further, two sub-analyses of service use were performed: of the 372, 223 individuals who had received one or more P-diagnosis at their GP or GP out of our services in the same period. Next, in timeframe were conducted, and of the 132,508 individuals who had accessed CAMHS services one or more times the year the turned 17. Data from national registers provided demographic, clinical, and healthcare utilization information. Poisson regression was used to assess associations between handover and key variables, adjusting for diagnostic covariates, socioeconomic- and immigration status.

Results: For the whole population, specialist mental health services were most used at age 16 (IRR 1.32) but declined notably after the age of 18 reaching a low at 19.5 (IRR 0.68), both compared to the reference group at 15.5 years. Simultaneously with an increase in the use of GP, with a lower IRR at 16 (IRR 0.81) and a higher at 21 (IRR 1.20), compared to the same reference group. Similar patterns revealed themselves for the Out-of-hours GP. Preliminary results identified a similar marked decrease in specialist mental health service use for the two additional samples after age 18 as well as for both males and females.

Conclusions: Findings might underscore the challenges young people face navigating between CAMHS and AMHS in a vulnerable period in life. The need for mental health services does not suddenly decline after age 18, and our results support previous research highlighting that *gaps and cultural differences between service levels explain the reduced use of specialized mental health care services after age 18.* These findings have the potential to inform policy and practice, emphasizing the importance of coordinated and flexible transitional pathways between the services.

D: Environmental

D1

Surrounding greenness and mortality in Norway: Results from The ELAPSE Project

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Introduction: Due to increasing urbanisation and densification of cities and towns, scientific knowledge about adverse and protective environmental factors is of crucial importance for the planning of healthy living environments. There is mounting evidence that neighbourhood surrounding greenness may promote health thru a range of possible mechanisms. Evidence that surrounding greenness may reduce risk of mortality from Non-Communicable Diseases and cancer is increasing, but more high-quality cohort studies are needed to strengthen the conclusions.

Aims: The aim of the present study was to examine the association between surrounding greenness and mortality in Norway.

Methods: The national administrative cohort NORCOHORT includes all Norwegian citizens aged 30+ living in Norway 1.1.2001, 2,6 mill individuals. The subjects were followed up until 2016 using the Cause of Death Registry. We investigated non-accidental, cardiovascular, respiratory, lung cancer and diabetes cause of death using predefined ICD-10 codes. Greenness surrounding home was measured using satellite data, Normalized Difference Vegetation Index (NDVI) for 300 m and 1 km buffer. We used Cox proportional hazard model, adjusting for age (time axis), sex, and sociodemographic variables such as education level and income, both on individual and area levels.

Results: Only minor differences in hazard ratio (HR) were found when comparing 300 m and 1 km buffer. HR for non-accidental mortality was below 1.0 and significant, HR 0.990 (95% confidence interval [CI] 0.986-0.993) within 300 m and HR 0.991 (95% CI 0.987-0.996) within 1 km buffer. Lowest HR was obtained when lung cancer was cause of death, HR 0.971 (95% CI 0.960-0.982) within 300 m.

Conclusions: In Norway, people living in areas with more surrounding greenness seem to be marginally protected against the causes of death studied, especially lung cancer. Knowledge informing the design of health promoting living environments is of crucial importance to the municipalities. Further analyses will examine whether associations between surrounding greenness and mortality vary between subgroups of the population (e.g. between different socioeconomic groups).

D2

A review of interaction effects of air pollution and non-optimal temperature on mortality and morbidity

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Introduction: Air pollution and non-optimal temperatures (heat and cold) are well-known public health risks. Before 2021, few studies explored how these factors might amplify each other's health impact, but many studies have emerged since.

Aims: Our aim was to review recent studies to assess interaction effects between air pollution and temperature, document any knowledge gaps and discuss possible explanations for any interaction effects.

Methods: We performed a mini-review on interaction effects of air pollution and temperature on mortality and morbidity. Using Web of Science (2021–present), we searched for terms such as "interaction", "synergistic", "air pollution", "temperature", "mortality" and "morbidity". After screening over 200 abstracts and 150 full texts, we included around 85 relevant studies. We extracted data on interaction direction, study location, pollutants, health outcomes, study design, and temperature metrics (e.g., heat waves or cold spells).

Results: Most studies examined how heat or cold modified the health effects of air pollution, rather than exploring the reverse (air pollution as a modifier for heat or cold stress). The majority reported synergistic effects, where heat (waves) or cold (spells) amplified pollution-related health risks. A smaller number of studies found antagonistic effects. A clear majority of studies were from China, followed by studies from the United States and Europe. Only a handful of studies were from Africa, South America or from other countries in Asia. The most studied pollutant was fine particulate matter (PM2.5), followed by ozone (O3), and then PM10, SO2 and NO2. Studies of morbidity were more common than studies of mortality. Health outcomes related to respiratory and cardiovascular diseases were most common, followed by diseases affecting young children or newborns (e.g., asthma or low birth weight).

Conclusions: We found considerable evidence of temperature and air pollution interacting synergistically to increase health burden across a range of diseases. Future heat waves combined with high air pollution will therefore pose significant threats to public health. We urge that future studies focus on less studied, but highly polluted locations, such as India.

D3

Daily exposure to second-hand smoke during childhood and risk of post-menopausal breast cancer in never smokers: The Multiethnic Cohort Study

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Introduction: Breast cancer is the most common cancer globally among women. Neither active smoking nor second-hand smoke are established risk factors for breast cancer. Children are the least able to protect themselves from second-hand smoke. About 80% of the world's smokers live in low- and middle-income countries, where especially many children and women are exposed to second-hand smoke, also referred to as environmental, involuntary, passive smoke or tobacco smoke pollution.

Aims: To examine the association between daily second-hand smoke exposure at home during childhood and postmenopausal breast cancer risk among never smokers in the Multiethnic Cohort (MEC) Study.

Methods: We analyzed data from 24,261 never-smoking female MEC participants, aged 60-89 years in 2008-2012, when they provided information on second-hand smoke exposure during childhood. We identified invasive breast cancer cases and tumour receptor status via linkage to the Hawaii and California Surveillance, Epidemiology and End Results Program cancer registries through December 2019. We used Cox proportional hazards models to estimate age-adjusted hazard ratios (HRs) and 95% confidence intervals (CIs), adjusting for race and ethnicity.

Results: During a mean follow-up of 7.8 years, we identified 709 incident, invasive breast cancer cases. Women reporting any childhood second-hand smoke exposure had a 17% higher risk (HR 1.17, 95% CI 1.00-1.36) of breast cancer compared with those reporting no childhood exposure; HRs were higher with exposure of ≥3 h/day (HR 1.24, 95% CI 1.02-1.51), exposure of ≥18 years (HR 1.26, 95% CI 1.04-1.53), and those with the highest joint exposure (≥3 h/day & ≥18 years) (HR 1.28, 95% CI 1.00-1.63). The childhood SHS exposure and breast cancer risk association did not differ when we stratified on nine established breast cancer risk factors, including race and ethnicity (all $P_{heterogeneity} \geq 0.17$).

Conclusions: Our findings in this diverse population add strong prospective evidence that daily second-hand smoke exposure during childhood increases the risk of postmenopausal breast cancer. Our results provide additional arguments for banning smoking in public and private places, including vehicles and homes when children are present.

D4

Occupational exposures and risk of disease, injuries and death among offshore petroleum workers and their children: A study protocol

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Introduction: The historical Norwegian Offshore Petroleum Workers (NOPW) cohort covering offshore petroleum work 1965–1998 has recently been merged with offshore workers from the newly established Heliport cohort covering 1966–2023.

Aims: The overarching purpose of the study is to assess risks of cancer, cardiovascular-, neurological-, and respiratory diseases, psychological conditions, injuries, and death according to hydrocarbon exposure, night shift work, and prescription drug use, in a combined cohort of Norwegian offshore petroleum workers and their offspring.

Methods: The NOPW cohort, (n=27,917) established by questionnaires in 1998, has been merged with the Heliport cohort (n=83,202), established by transport data in 2023, for a combined cohort (n=100,332) with work histories spanning 1965–2023 (inclusion criterion >2 days of offshore work). The combined cohort will be linked to the Medical Birth Registry of Norway (MBRN) for identification of the offshore workers' offspring (n≈186,000). Parental exposures will be assessed via work histories, job-exposure matrices, and two survey-questionnaires (from 1998 and 2023). The combined cohort will also be linked to national registries for follow-up and assessment diseases, injuries and deaths among the workers and their children. Excess incidence and mortality will be assessed by standardized mortality and incidence ratios. Cause-specific analyses will be conducted by Cox regression or by estimating cumulative incidence from multistate models. Inverse probability of treatment weights will be used to estimate adjusted (weighted) cumulative incidence curves with death as a competing event.

Discussion: Unique personal identity numbers and national disease registries in Norway offer an exceptional possibility for studies of health outcomes in offshore petroleum workers and their children, that may add important new evidence of exposure-related health hazards. Up until now, the main research focus among offshore workers has been cancer risk. Exploitation of other health outcome registries, and especially among the children using the MBRN, is warranted for a more complete understanding of the disease burden. The project is approved by the Regional Committee for Medical Research Ethics and the Data Protection Officer.

E: Diabetes

E1

Twenty years later: Predictors, burden, and management of diabetes at age 70 – Findings from the Hordaland Health Study

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Introduction: Diabetes is a public health concern with substantial individual and societal impact. There is a need for deeper understanding of how midlife predictors are associated with subsequent diabetes status, disease burden, and glycemic control. This study uses 20-year follow-up data from the Hordaland Health Study (HUSK) to examine these associations.

Aims: 1) Identify demographic and health characteristics among participants without diabetes in HUSK2 predicting prediabetes and diabetes in HUSK3 and 2) describe diabetes-specific characteristics among participants with diabetes in HUSK3.

Methods: This longitudinal cohort study included 2,216 participants. Logistic regression was applied to identify predictors of prediabetes, undiagnosed diabetes and diabetes at follow-up. Among participants with diabetes at HUSK3, diabetes-specific characteristics, including diabetes distress (Problem Areas in Diabetes (PAID-5)) and self-perceived ability to manage the condition (The Perceived Competence for Diabetes Scale (PCDS)), were described.

Results: Of the 2,216 participants in HUSK3, 129 had been diagnosed with diabetes, while 163 had undiagnosed diabetes or prediabetes, according to HbA1c-levels. Adjusted logistic regression analyses identified significant predictors of diabetes at follow-up: male (OR 1.9, 95% CI 1.3-2.7), low education (OR 2.1, 95% CI 1.2-3.5), obesity (OR 8.6, 95% CI 4.5-16.3), hypertension (OR 1.8, 95% CI 1.2-2.8), smoking (OR 1.5, 95% CI 1.0-2.1), snoring (OR 2.2, 95% CI 1.0-4.7), feeling tired at work/off-work (OR 3.9, 95% CI 1.1-13.6). For prediabetes and undiagnosed diabetes, the significant predictors were: low education (OR 1.9, 95% CI 1.2-3.2), obesity (OR 3.0, 95% CI 1.5-5.9), and hypertension (OR 2.2, 95% CI 1.4-3.4). Among participants with diabetes, 27.6% reported not so good or poor self-rated health. Additionally, 13.3% experienced high levels of diabetes distress, as indicated by a PAID-5 sum score ≥8 and 30% reported low self-perceived ability to manage their diabetes, with a mean PCDC score of 4.0 (SD 1.7).

Conclusions: Male sex, obesity, hypertension, educational level, and smoking were key predictors of diabetes over 20 years. Many individuals with diabetes reported poor self-rated health, high distress, and low confidence in managing their condition, highlighting the need for targeted interventions.

E2

Validation of algorithms for diabetes classification based on linked register-data in Norway

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Introduction: Classification of type 1 and type 2 diabetes may be difficult, especially type 1 diabetes in older adults and type 2 diabetes in younger people.

Aims: We aimed to validate algorithms for classifying type 1 diabetes (T1D) and type 2 diabetes (T2D) based on nationwide administrative registry data for residents aged 18 years or older.

Methods: We developed an algorithm to define T1D and T2D based on individually linked data on diagnoses from primary and non-primary care and glucose lowering medication for all residents 18 years and older in Norway in 2022, using the Norwegian Diabetes Register for Adults (NDR-A) as reference.

Results: The overall sensitivity and positive predictive value (PPV) for the algorithm were 95.2% and 94.7% for T1D, and 97.6% and 97.9% for T2D. The PPV for T1D was 97% or more in age-groups 18-39 and 40-59, 87.6% in those aged 60-79 and 69.4% in those older than 80 years. The PPV for T2D was 97% or greater for age-groups 40 or more, and 92.1% for those aged 18-39. Among 4,315,563 people 18 years and older living in Norway in 2022, 31,264 had diagnosed T1D (0.72%) and 239,120 had diagnosed T2D (5.5%), according to the algorithm.

Conclusions: While classification of diabetes in some cases can be challenging, diabetes types defined from linked register-based data corresponded well with the classification in the medical quality registry for adult diabetes in Norway.

E3

Pre-pregnancy body mass index and risk of gestational diabetes mellitus by maternal country of birth: A registry-based study

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Introduction: Pre-pregnancy body mass index (BMI) is a strong risk factor for gestational diabetes mellitus (GDM), but knowledge on how this association varies across populations is limited.

Aims: We aimed to describe the association between pre-pregnancy BMI and GDM in non-immigrant and immigrant women by maternal region of birth.

Methods: We analyzed data from the Medical Birth Registry of Norway and Statistics Norway (2016-2021). Immigrants were categorized by country of birth and grouped by seven super regions defined by the Global Burden of Disease study. BMI was analyzed both as a continuous and categorical variable, using the well-known WHO classification, with different thresholds for Asian subgroups. Statistical analysis involved logistic regressions. Also, country-level analyses were made plotting GDM prevalences by mean BMI (ecological analyses).

Results: Of 267,371 singleton births, 187,967 (70%) were to non-immigrants and 79,404 (30%) to immigrants. Prevalence of GDM increased with pre-pregnancy BMI for all groups. The association appeared similar across groups despite substantial different background prevalence of GDM between groups. Interestingly, women from countries with the highest/lowest mean BMI did not have the highest/lowest GDM prevalence. For example, women from the Philippines had a GDM prevalence of 15% at BMI 23 kg/m^2, while Islandic women had a 5% GDM prevalence at BMI 26 kg/m^2.

Conclusion: The association between BMI and GDM was independent of region of birth, despite varying background GDM prevalence. However, the inconsistency in BMI-GDM relation in the country-level analyses, suggests that some women may be more genetically susceptible to GDM, irrespective of BMI.

E4

Associations of diabetes duration with anxiety, depression, and insomnia in people with type 2 diabetes

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Introduction: Systematic reviews have concluded that depression, anxiety, and insomnia are common in people with type 2 diabetes (T2D). More knowledge regarding risk factors for poor mental health disorders is needed, in order to implement targeted preventative care interventions.

Aims: To examine whether diabetes duration was associated with use of medication for depression, anxiety, or insomnia, and if possible associations were modified by age and age at type 2 diabetes onset, in addition to sex and education.

Methods: This study is part of the national registry-based cohort study *Outcomes & Multi-morbidity In T2D* (OMIT). We used data from 55,083 individuals with T2D from the Norwegian Diabetes Register for Adults (2006-2019). Adjusted associations between diabetes duration with anxiety, depression, and insomnia and effect modifications of age groups, age at diabetes onset, in addition to supplemental analyses of sex and education, were estimated using binary logistic regressions with generalized estimation equations. Diabetes duration categories was: '0-4 years'; '≥5-9 years'; ≥10-19 years'; and '≥20 years'.

Results: Twelve percent of the individuals used medication for depression, 10% for anxiety, and 16% for insomnia. The prevalence estimates increased with diabetes duration in nearly all subgroups. For anxiety and insomnia, a stronger association was found in those with early onset T2D compared to late onset (Anxiety: Per category change in diabetes duration 1.3% (95% CI 0.9-1.8), P for interaction = 0.001; Insomnia: Per category change 1.9% (95% CI 1.3-2.4), P for interaction: 0.01). Those with early onset T2D also had a stronger association between diabetes duration and depression (per category change 0.7% (95% CI 0.2-1.2), P for trend = 0.003) than those with late onset T2D.

Conclusions: This study found an association between diabetes duration with the prevalence of depression, anxiety, and insomnia, a trend seen across most studies sub-groups. Health care providers should have a proactive approach to address mental health disorders an early stage of the disease trajectory, e.g., by using patient reported outcome measures, as early detection provide better opportunities to prevention and treatment. Future studies investigating triggering factors for mental health disorders in people with T2D are needed.

F: Physical activity

F1

Prospective associations between daily steps and fat mass across demographic, lifestyle, and genetic risk factors

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Introduction: The use of wearable monitors has the potential to prevent weight-gain through goal-setting and feedback, but the number of daily steps needed to prevent excess fat mass accumulation is unknown.

Aims: 1) Determine the dose-response relationship between daily step count and fat mass, and 2) determine if the relationship varies by age, socioeconomic status (deprivation index), dietary quality, and genetic predisposition to obesity.

Methods: We analyzed data from 8,979 adults from the UK Biobank study (mean (SD) age: 61 (8) years, 55% women). Daily steps were derived using a validated algorithm applied to seven days of wrist-worn accelerometry data. Total fat mass was determined using DXA measured on average 4.5 years after the accelerometry assessments. Multivariate models were adjusted for demographic, lifestyle, and pre-baseline body composition variables (measured two years prior to accelerometry). The analysis was stratified by age, deprivation, diet quality, and body mass index polygenic risk score (PRS) groups.

Results: The dose-response relationship between daily steps and fat mass was linear in women, but non-linear in men with no further benefit beyond ≈ 12,000 daily steps. Compared to the reference (≈6000 steps/day), taking 10,000 daily steps was associated with a one kg difference in total body fat mass, corresponding to ≈ 4% of the sample-mean body fat (25 kg). The magnitude of the association was consistent across subgroups with no appreciable difference.

Conclusions: A higher daily step count was associated with lower total body fat mass across age, deprivation, diet quality, and genetic propensity to obesity. These findings emphasize the potential of daily step targets as an accessible strategy for preventing weight gain regardless of demographic, lifestyle, or genetic risk factors.

F2

Weekly physical activity patterns in short- and long-term survivors of childhood cancer compared to controls: The PACCS and Surfit Studies

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Introduction: To develop targeted interventions aiming to increase physical activity (PA) in childhood cancer survivors (survivors), knowledge beyond weekly average time in PA is important.

Aims: To identify and describe weekly PA patterns in survivors and compare them to controls.

Methods: This study includes child/adolescent (9-18 years) survivors (n=434) and controls (n=107) from the Physical Activity in Childhood Cancer Survivors (PACCS) study, young adult (18-49 years) survivors from the Survivor Fitness (SURfit) study (n=156) and controls from the Norwegian PA Surveillance Study 2 (n=911). Moderate-to-vigorous and light PA (MVPA, LPA) were measured with accelerometers (ActiGraph GT3X+), and harmonized according to suitable criteria for either children/adolescents or adults. Weekly PA patterns were identified by multivariate latent class mixed models, with separate models for child/adolescent and young adult survivors and controls. We used weekday as timescale and daily average minutes of MVPA and LPA as longitudinal outcomes. We ran models with 1-6 classes and determined the optimal number of classes using fit indices (AIC, BIC, entropy).

Results: The child/adolescent survivors (mean age ± standard deviation: 12.1 ± 2.2 years) were, on average, five years old at diagnosis (main diagnosis: 47% leukemia). Compared to controls (13.2 ± 2.6 years), a higher percentage of survivors was overweight/obese (30% vs. 11%). The young adult survivors (30.6 ± 8.6 years) were, on average, seven years old at diagnosis (35% leukemia). Compared to controls (33.8 ± 8.1), a lower percentage was overweight/obese (33% vs. 43%). The 4-class model was identified as the best model across all samples. In child/adolescents, more survivors than controls were allocated to a *Medium regular* (41% vs. 17%) or a *Medium, drop weekend* trajectory (32% vs. 23%) of MVPA and LPA, whereas fewer survivors were allocated to a *Low regular* (20% vs. 31%) or a *Medium, peak Friday* trajectory (8% vs. 29%). In young adults, fewer patterns were comparable between survivors and controls, however, patterns of young adult survivors were overall more favorable compared to controls.

Conclusions: Most survivors had a satisfying level of PA, however, a marked group of child/adolescent survivors are in need of PA interventions. Unfavorable PA patterns may exacerbate survivors' already elevated risk of treatment-related late effects.

F3

Trends in thinness among children and adolescents

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Introduction: Thinness in children and adolescents is a risk factor for a range of negative health outcomes. As the determinants of thinness are multifaceted and vary across populations, weight development should be monitored in national or regional settings. No previous studies have explored current prevalence and temporal trends in thinness among Norwegian children and adolescents in the age range 2 to 13 years.

Methods: The study was based on longitudinal data from an electronic medical record in the municipality of Bergen (Health Profile 0-20). Objectively measured height and weight were routinely collected among 78024 children and adolescents aged 2, 4, 6, 8, and 13 years living in the municipality of Bergen in the period 2010-2022. Thinness was defined as a body mass index below the age and sex-specific cut-off points for thinness grade 2 proposed. Trends were estimated for boys and girls in the respective age groups using regression models. Interaction analyses were conducted to elucidate the differential impact of sex on age-related trajectories of thinness development.

Results: The prevalence of thinness ranged from 5.2% (girls 2 years) to 0.9% (boys 8 years). Overall, a higher prevalence was observed in younger, compared to older, boys and girls. The decrease in prevalence by age was more pronounced in girls compared to boys ($p<0.001$). During the years of observation (2010-2022), only 2-year-old girls ($p<0.001$) and boys ($p=0.009$) showed a statistically significant decline in the prevalence.

Conclusion: Overall, the prevalence of thinness was relatively low. Trends remained unaltered during the years 2010-2022, except for 2-year-old girls and boys, were prevalence declined. Further research is needed to explain age and gender related differences in prevalence and trends in thinness.

F4

Deaths potentially averted by small changes in physical activity and sedentary time: An individual participant data meta-analysis of prospective cohort studies with up to 135,046 men and women

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Introduction: Physical inactivity is estimated to cause as much as 7 to 9% of global mortality. However, these estimates are based on self-reported physical activity which is prone to biases. Thus, the effects of small, realistic changes in physical activity and sedentary behaviour on population-level mortality are unclear.

Aims: To estimate the proportion of deaths preventable by five- and 10-minute incremental increases in moderate-to-vigorous physical activity (MVPA) and 30- and 60-minute reductions in daily sedentary time.

Methods: Individual participant data meta-analysis of prospective cohort studies with device-measured physical activity and sedentary time. We included seven cohorts from Norway, Sweden, and the US (N=40,327; 4895 deaths). Data from the UK Biobank (n=94,719; 3487 deaths) were analysed separately. We estimated the proportion of deaths prevented by changes in 1) the least active ~20% of participants ("high-risk approach") and 2) all participants except the ~20% most active ("population-based approach"). Potential impact fractions were calculated from adjusted hazard ratios estimated for five-minute increases in MVPA and 30-minute reductions in sedentary time from observed levels across the activity distribution.

Results: A five-minute increase in MVPA per day in the least active ~20% of participants may prevent 6.0% (95% CI: 4.3% to 7.4%) of all deaths. A similar increase in MVPA in all participants except the ~20% most active may prevent 10.0% (95% CI 6.3% to 13.4%) of all deaths. Reducing sedentary time by 30 minutes per day may prevent 3.0% (2.0% to 4.1%) and 7.3% (4.8% to 9.6%) of all deaths in the two corresponding scenarios, respectively. Results from the UK Biobank were of a smaller magnitude but still substantial; for example, reducing sedentary time by 30 minutes per day in all except the most active 20% was associated with 4.5% (2.8% to 6.1%) prevented deaths.

Conclusion: Small and realistic increases in MVPA of five minutes per day may prevent up to 6% and 10% of all deaths when targeted in a 'high-risk' and a 'population' approach, respectively. Reducing sedentary time by 30 minutes per day may prevent a smaller, but still meaningful, proportion of deaths in the two risk scenarios.

G: Methods

G1

Distributing disease burden from county to municipality level: Developing a model for scaling global burden of disease results on YLL to local contexts

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Introduction: Local health burdens estimates are crucial for effective public health planning. The Global Burden of Disease (GBD) study provides national and, for some countries, subnational estimates of Years of Life Lost (YLL), but these may overlook local variations essential for targeted interventions.

Aims: This study aimed to develop a robust method to downscale county-level GBD YLL estimates to the municipality level using statistical and machine learning approaches.

Methods: A cohort study using Norwegian population-based registries (2015-2019) applied models like XGBoost, Random Forest, Generalized Additive Models, and Bayesian regression to redistribute YLL rates. Initially, models were tested without additional covariates. The best-performing model, XGBoost, was then enhanced with demographic, socioeconomic, healthcare accessibility, environmental risk factors, health expenditures, and general practitioner consultation frequencies. Performance was evaluated using RMSE, MAPE, and R^2. All analyses were conducted in RStudio.

Results: XGBoost showed the highest predictive accuracy, with the lowest RMSE and highest stability. The full model, including contextual predictors, outperformed an age-and-sex-only model. Post-prediction adjustments using county-level scaling factors further improved accuracy.

Conclusions: This study presents a machine learning approach for downscaling YLL estimates to the municipality level, enhancing spatial granularity in disease burden assessments. This facilitates targeted public health interventions and efficient resource distribution. The framework offers a scalable solution for refining local health metrics, with potential applications beyond Norway. Further research is needed to validate the model in different settings and for different metrics, such as years lived with disability.

G2

Disentangling influenza, SARS-CoV-2, and rhinovirus from syndromic surveillance data using matrix factorization: Important implications for international disease surveillance

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Introduction: Syndromic surveillance systems play a key role in tracking the spread of influenza-like illness (ILI). ILI consultation rates reported by general practitioners capture a broad clinical picture that includes respiratory infections caused by a range of viral and bacterial pathogens. However, disentangling the relative contributions of these co-circulating pathogens to the overall ILI burden remains a challenge.

Aims: This study aims to evaluate the ability of unsupervised matrix factorization techniques to extract symptom clusters from weekly collected symptom data and to determine how well these clusters align with laboratory-confirmed pathogen incidence to provide an innovative approach to bridge syndromic and virological surveillance.

Methods: We analyzed weekly aggregated symptom reports collected through participatory surveillance platforms in the Netherlands and Italy over five respiratory seasons (2020-2025). The Dutch platform included weekly sampling of nose- and throat swabs enabling detection of circulating pathogens. The symptom reports were structured as symptom-by-week matrices and decomposed into latent components using Non-negative Matrix Factorization (NMF). The resulting symptom clusters were evaluated for their correlation with laboratory-confirmed cases of influenzavirus, SARS-CoV-2, and rhinovirus. We additionally assessed the possibility to transfer symptom clusters extracted from the Netherlands to the Italian data to monitor pathogen incidence from quasi-real time symptom reports.

Results: NMF identified eight symptom clusters, three of which corresponded closely with the temporal dynamics of known respiratory viruses. We identified one symptom cluster moderately correlated with influenza, another with SARS-CoV-2, and a third strongly correlated with rhinovirus. By transferring symptom clusters identified through the Dutch data to the Italian data, we observed similarity of symptom clusters in terms of symptoms frequency and good accuracy at recovering the incidence of SARS-CoV-2 and influenzavirus provided by sentinel surveillance in Italy.

Conclusions: These results suggest that unsupervised decomposition of symptom data can disentangle the co-circulation of respiratory pathogens from syndromic data allowing for timely insights into pathogen circulation. Moreover, the approach is generalizable and transferable to countries with a comparable design of their surveillance, opening up international optimization of sampling per country.

G3

Gestational age determination in pregnancies conceived by assisted reproductive technology

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Introduction: Accurate calculation of gestational age (GA) is essential for monitoring fetal development and preventing iatrogenic preterm or postterm births. Pregnancies conceived with assisted reproductive technologies (ART) are commonly referred to as the gold standard for dating models since the fertilization date is known. Nonetheless, it is uncertain whether ART pregnancies are representative of naturally conceived pregnancies.

Aims: Among pregnancies conceived by ART, we compared two dating methods—a standardized, population-based ultrasound model and an ART approach based on the known fertilization date. Furthermore, we investigated whether 14 or 15 days more precisely reflected the median follicular phase.

Methods: We employed population data from the Medical Birth Registry of Norway in 2015–2021. Our cohort included 167,691 singletons, with 2067 conceived in fresh cycles, and 2080 conceived in frozen cycles. We assessed the statistical agreement between the models by calculating individual differences in GA estimates. Bias and precision in estimated date of delivery (EDD) were assessed by constructing cumulative birth distribution (Kaplan-Meier) curves, employing time-to-event analysis to account for the substantial number of nonspontaneous onset of births.

Results: The individual differences between ultrasound and ART dating were small. The difference was one day or less for 46.9% of the measurements in fresh cycles and 42.0% in frozen cycles. We observed a systematic one-day difference, which can be improved by assuming a 15-day follicular phase in the ART formula. Both models showed similar precision in EDD. Pregnancies conceived in frozen cycles had a median duration of 286 days and were 2.5–3 days longer than those conceived naturally or in fresh cycles.

Conclusions: The close agreement between ultrasound and ART dating implies that both methods perform equally well for dating in ART pregnancies. However, 15 days, instead of 14 days, should be added to the ART model to obtain equivalent GA estimates. ART pregnancies, whether fresh or frozen, do not follow the same birth distribution as naturally conceived pregnancies and should not be used as a reference for all pregnancies.

G4

Implementing ChatGPT in an epidemiology course: Experiences of teachers and students

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Introduction: Large language models such as ChatGPT have entered higher education, yet empirical evidence on their pedagogical value and limitations remains scarce.

Aims: We explored how teachers and postgraduate students experienced the incorporation of ChatGPT into a Master's/PhD-level epidemiology course, focusing on its use as (A) a teacher assistant, (B) an in-class learning tool, and (C) support for take-home assignments.

Methods: ChatGPT (GPT-3.5, chatgpt.com) was integrated throughout a five-week course in spring 2023. Teachers documented reflections (n = 2) after each session. Students (n = 9) completed an online questionnaire and 20 volunteered for semi-structured oral interviews; a second cohort (n = 14) completed a follow-up questionnaire. Data were analyzed thematically by two independent researchers.

Results: *Teacher assistant* - ChatGPT accelerated brainstorming of workshop formats, quiz generation and slide drafting, but answers were occasionally inaccurate and required iterative prompt engineering and subject-matter verification. *In-class activities* - Real-time querying stimulated discussion, revealed misconceptions, and promoted a critical stance toward AI-generated content. *Home assignments* - Students mainly used ChatGPT to clarify questions, polish language, and cross-check answers. Reported benefits included broader perspectives and enhanced confidence; limitations were factual errors, superficial depth, and algorithmic biases. Across contexts, engaging with ChatGPT promoted critical appraisal skills and dialogue about academic integrity.

Conclusions: Early adoption of ChatGPT in epidemiology teaching shows promise as both a pedagogical partner and a writing aid, provided its outputs are critically evaluated. Structured guidance and prompt-engineering literacy are essential to unlock benefits while safeguarding academic rigor. Future research should explore learning gains and investigate long-term effects on assessment practices.

G5

Using ChatGPT to assess risk of bias in randomized controlled trials of medical interventions

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Introduction: Assessing the risk of bias in randomized controlled trials (RCTs) is a crucial step in systematic reviews, but it is often time-consuming and resource-intensive. Artificial intelligence tools like ChatGPT may offer a way to streamline this process, yet their reliability for such tasks remains uncertain.

Aims: This pilot study aims to evaluate the agreement between ChatGPT and human reviewers in assessing the risk of bias in RCTs of medical interventions.

Methods: We will identify recently published Cochrane systematic reviews that include RCTs and have completed risk of bias assessments. ChatGPT will be prompted to assess the same outcomes using three types of instructions: minimal, maximal, and optimized prompts. The level of interrater agreement between ChatGPT and human reviewers will be measured using weighted kappa statistics for overall and domain-specific risk of bias ratings.

Results: We identified 75 risk of bias assessed RCTs from Cochrane reviews, using the RoB-tool. Human-ChatGPT agreement for "Overall" risk of bias assessment was 50.7% (95% CI 39.3%–62.0%), substantially higher than expected by chance ($P = 0.0015$), and better than many human reviewer pairs.

Conclusions: ChatGPT appears to have some ability to assess risk of bias in RCTs of medical interventions and is unlikely to be guessing or "hallucinating". ChatGPT may be able to help streamline and improve evidence synthesis production.

H: Genetics

H1

Maternal and paternal educational attainment and adult offspring's cardiovascular disease risk factors: An intergenerational Mendelian randomization study

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Introduction: Parental educational attainment (EA) is associated with offspring's cardiovascular disease (CVD) risk factors. Yet, it is unclear whether these associations are attributable to genetic transmission (i.e., inheritance of genetic variation) or genetic nurturing effects (i.e., parental genotype influencing the rearing environment).

Aims: To evaluate the role of direct and indirect genetic mechanisms that underlie the association between maternal/paternal EA and adult offspring's CVD risk factors.

Design: A two-sample intergenerational Mendelian randomization (MR) study.

Setting: We used summary statistics from genome-wide association studies (GWAS) on the effect of maternal and paternal genotypes on offspring's CVD risk factors. Analyses were performed using unadjusted and adjusted (i.e., by genetic transmission or genetic nurturing) GWAS summary statistics.

Exposure: Maternal and paternal EA.

Main outcomes: Adult offspring's body composition [body mass index (BMI) and waist/hip ratio (WHR)]; blood lipids [high-density lipoprotein (HDL-c), low-density lipoprotein (LDL-c), total cholesterol (TC), and triglycerides (TG)]; blood pressure [diastolic blood pressure (DBP) and systolic blood pressure (SBP)]; and other CVD risk factors [C-reactive protein (CRP), haemoglobin A1c (HbA1c), and glucose].

Results: MR analyses performed using unadjusted GWAS estimates suggested that parental EA improved most of the outcomes, except for LDL-c, TC, glucose and HbA1c. A one standard deviation (SD) unit increase in maternal or paternal EA was associated with a lower BMI, WHR, TG, SBP, DBP, and CRP and higher HDL-c. After accounting for genetic transmission, maternal and paternal EA effects on all offspring's CVD risk factors attenuated and overlapped with the null, except for WHR [maternal EA: -0.05 (-0.09, -0.01), paternal EA -0.07, (-0.12, -0.02)]. Accounting for parental genetic nurturing slightly attenuated the effects of offspring EA on own CVD risk factors.

Conclusions: Genetic transmission explained a large part of the association between maternal/paternal EA and offspring CVD risk factor levels. Genetic nurturing which partially underlie environmental transmission, likely play a modest role in the inter-generational transmission of CVD risk factors.

H2

Statistical methods to disentangle genetic effects influencing infertility and early fetal viability

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Introduction: Infertility affects millions worldwide, with genetic factors contributing at multiple stages before and during pregnancy. Parental genotypes, individually or through interactions, influence the probability of fertilization, while the fetal genotype is a key determinant of early fetal survival. Studying these effects separately may cause them to alias each other. To distinguish parental interaction effects from fetal effects, we jointly analyzed them in parent-child triads and dyads. Separating family units based on conception with assisted reproductive technology (ART) versus natural conception (non-ART), our objective was to identify genetic effects associated with reduced or enhanced reproductive capacity.

Aims: 1) To develop statistical models that differentiate parental interaction effects on fertilization success from fetal effects on fetal survival, and 2) To apply these models in genome-wide analyses of ART and non-ART family units separately, comparing genetic effects between the two groups.

Methods: We extended the case-parent triad design to jointly estimate parental and fetal genetic contributions. All offspring were treated as carriers of the outcome “fetal survival”, and analyses were conducted separately on ART and non-ART family units. Genotype data from roughly 43,000 family units, including 1,336 ART-conceived offspring, were available in the Norwegian Mother, Father, and Child Cohort Study (MoBa).

Results: In the non-ART sample, we identified genome-wide significant fetal effects on fetal survival for SNPs located in regions harboring genes implicated in infertility and fetal development, including *MDC1*, *HCP5*, *MICB*, and *NOTCH4*. Partial overlap in fetal effects was observed when replicating the analysis in the ART sample. Parental interaction effects were detected in both samples, though the associated variants differed. Several SNPs linked to parental interaction effects in the ART sample mapped to genes previously implicated in male infertility, such as *ACTB, FSCN1*, and *RNF216*.

Conclusions: We introduced a novel methodology for jointly estimating parental and fetal genetic contributions. Our analyses revealed significant parental interaction and fetal effects in genes related to infertility and fetal viability. These findings advance understanding of the genetic architecture of infertility and fetal development. Challenges nevertheless remain in analyzing rare variants, underscoring the need to replicate these analyses in other cohorts.

H3

Parental infertility and risk of juvenile idiopathic arthritis in their child: Exploring potential shared genetic risk factors within a population-based pregnancy cohort

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Introduction: Children born to women with infertility appear to have an increased risk of juvenile idiopathic arthritis (JIA), suggesting shared underlying risk factors. As hormonal dysregulation, a common cause of infertility, is also implicated in autoimmunity, shared genetic, hormonal, or immune mechanisms may contribute to both infertility and JIA.

Aims: To investigate whether parental infertility and genetic risk for infertility, measured by polygenic risk scores (PRS), are associated with JIA in their child.

Methods: We used self-reported data from the Norwegian Mother, Father, and Child Cohort Study (MoBa) on time-to-pregnancy and history of infertility treatment. JIA was identified through ≥2 ICD10 diagnoses (M08, M09) in the Norwegian Patient Registry. Multivariable logistic regression assessed associations between infertility and JIA, adjusting for parental age, education, inflammatory rheumatic disease, parity, and gestational smoking. We also examined the association between a maternal PRS for all-cause infertility and JIA risk in the child, adjusting for genetic principal components. Analyses were stratified by sex.

Results: The analytical sample included 222 parental couples of children that later developed JIA (cases) (81 boys and 141 girls) and 70,932 non-cases. Genotype data were available for a subsample of mothers (n=37,604). Ever receiving infertility treatment was associated with increased JIA risk (aOR 1.56, 95% CI 1.06–2.31), particularly in boys (aOR 2.04, 95% CI 1.15–3.63). The maternal infertility PRS was strongly associated with all infertility measures ($p<0.001$) and with increased JIA risk in boys (aOR 1.33, 95% CI 1.03–1.71), but not in girls (aOR 0.97, 95% CI 0.79–1.18). No clear associations were observed for time-to-pregnancy, possibly due to a smaller sample size.

Conclusions: This is the second study to find an association between parental infertility and increased risk of JIA in their child. A novel contribution is the use of PRS as a proxy for infertility, identifying an association between genetic risk of maternal infertility and increased risk of JIA in boys. These findings suggest shared, potentially genetic, risk factors between the two conditions and warrant further investigation.

H4

Thyroid function and risk of sepsis: Triangulation from prospective observational and Mendelian randomization analyses

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Introduction: Thyroid hormones modulate cells in the immune system; however, the risk associated with thyroid function and risk of infectious diseases remains unclear. This study triangulates observational and Mendelian randomization (MR) analyses to investigate thyroid-stimulating hormone (TSH) levels and risk of sepsis.

Aims: To investigate the association between thyroid function and risk of sepsis.

Methods: In observational analysis of 45,364 individuals aged >18 years from the Trøndelag Health Study (HUNT2 and HUNT3), we used Cox regression analyses to estimate the association between TSH levels at HUNT participation with risk of hospitalization with sepsis adjusted for sex, marital status, education level, smoking and body mass index. Two-sample MR analyses were performed using summary statistics of genetically predicted TSH levels from the ThyroidOmics Consortium (n= 271,040) with genetic liability to sepsis using UK Biobank (n=10,154 sepsis cases and 462, 918 controls). Secondary analyses were conducted to explore associations between other thyroid function measures and risk of sepsis, or between TSH levels and risk of lower respiratory tract infections and upper urinary tract infections – two of the most common causes of sepsis.

Results: In the observational analysis, we found little evidence that TSH levels increased risk of sepsis (hazard ratio 0.98 [95% CI 0.93-1.04] per mU/L unit increase). Participants with TSH levels < 0.5 mU/L had increased risk of sepsis (HR 1.50, 95% CI 1.19–1.90), compared with the reference range (0.5-1.4 mU/L). In the MR analysis we found no evidence of a causal relationship between genetically-predicted TSH levels and risk of sepsis (odds ratio 1.04 [95% CI 0.98-1.10] per standard deviation unit increase), nor between low levels of TSH and sepsis (odds ratio 0.98, 95% CI 0.94–1.10). Secondary analyses generally supported that there was no clear link between thyroid function and risk of sepsis or other severe infections.

Conclusion: While observational data suggested higher sepsis risk with low TSH, genetic evidence points to that this may reflect confounding by comorbidities. Triangulating observational and genetic methods, we did not observe a robust association between thyroid function measures and the risk of severe infectious diseases.

H5

Fine-scale population structure in the Norwegian Mother, Father, And Child Cohort Study (MoBa): Quality control of new genotype set

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Introduction: The Norwegian Mother, Father, and Child Cohort Study (MoBa) is a population-based pregnancy cohort comprising over 114,000 children, 95,000 mothers, and 75,000 fathers. MoBa's unique size, nationwide coverage, and inclusion of rich phenotype and genotype data make it an excellent resource for medical genetics research. MoBa genotypes have undergone multiple rounds of phasing, imputation, and quality control (QC) through continuously improving pipelines. A new official genotype set with more flexible QC and filtering parameters than the current set is currently in preparation by the Norwegian Public Health Institute (FHI). Principal components analysis (PCA) is a standard QC step to detect cryptic population structure that could yield false positives in genetic epidemiology studies. However, PCAs are limited in resolution to relatively coarse-grained structure, making them unable to detect subtle substructure. In addition, an analysis of fine-scale structure allows for the detection of any issues that might have arisen during phasing or imputation.

Aims: To perform a QC step in the alpha-testing of FHI's new genotype set by identifying and visualising fine-scale genetic structure in a subset of individuals.

Methods: We analysed a subset of 989 unrelated children from FHI's genotype set. Fine-scale genetic structure was identified using a recently developed, fast and accurate estimator of genome-wide haplotype sharing, followed by a haplotype-based clustering algorithm that has been a standard tool in population genetics for many years. Substructure can be readily visualised by plotting inferred genetic clusters on a geographical map, which here is done by linking individuals to their health region of birth using the medical birth registry of Norway.

Results: The results show a general correspondence between fine-scale genetic clustering and major geographical regions.

Conclusions: FHI's new genotype set displays the expected genetic structure and shows promise for utility in future genetic epidemiology studies.

I: Aging

I1

Forecasting the disease burden in the Nordic countries in 2050: An analysis of the GBD Study

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Introduction: Detailed forecasts of disease burden are critical for policymakers to anticipate population health needs, allocate resources and optimise healthcare systems. The Global Burden of Diseases, Injuries and Risk Factors Study (GBD) is the largest effort to quantify health loss across places and over time and has in recent years developed methods to forecast future disease burden. The latest iteration of GBD produced detailed scenarios for future mortality and disease burden for 204 countries and territories up to 2050. The Nordic countries were included in these analyses.

Aims: To examine and present forecasted life expectancy (LE), healthy life expectancy (HALE) and disease burden in the Nordic countries from 2022 to 2050 using forecasting estimates from GBD 2021.

Methods: Future health scenarios in GBD were modelled based on mortality, fertility, sociodemographic drivers, risk factor exposures and cause-specific incidence and prevalence by sex, age and location. Additional potential for improved LE and HALE was compared between a most likely reference scenario and an alternative scenario where key risks for non-communicable diseases (NCDs) were eliminated towards 2050.

Results: LE, HALE, and disease burden in the Nordic countries were forecasted to continue to improve but at a slower pace than in the past thirty years. Between 2022 and 2050, the annual increase was forecasted to be 0.08 years (0.07-0.09), reaching 84.71 years by 2050. The largest increase in life expectancy was forecasted in Finland with 3.68 years, followed by Iceland (2.35 years), Denmark (2.28 years), Norway (1.79 years) and Sweden with 1.69 years. Gains in HALEs were smaller. Population growth and ageing led to an increase in the burden for several age-related causes, while the disease burden for many non-fatal causes was forecasted to remain stable. Eliminating NCD risks could add 2 to 4 years to future life expectancy in 2050.

Conclusion: The Nordic countries will likely continue to enjoy long life-expectancy and relatively good public health in the future, but population growth and ageing will put significant strains on the welfare and healthcare systems. Policies are essential to mitigate risk factors to promote a healthier, longer-living population.

I2

The association of chronic musculoskeletal pain during midlife with physical performance at older age: The Tromsø Study

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Introduction: Living independently at home is important for people of all ages. Accumulating evidence links chronic pain with impaired physical function among older adults. For better tailoring of preventive measures and treatment interventions, it is important to identify people at risk of future impaired physical performance.

Aim: To study the association of chronic musculoskeletal pain during midlife with physical performance at the age of 60 years or older.

Methods: This is a prospective cohort study of 3746 men and women in the Tromsø Study (4,6,7), aged 60 years or older in Tromsø 7. Information about musculoskeletal pain lasting ≥3 months were collected by self-administered questionnaires in Tromsø 4 (1994-95) and Tromsø 6 (2007-08). In Tromsø 7 (2015-16), the participants were testing using the Short Physical Performance Battery (SPPB). We dichotomized the SPPB scores as ≤9/>10. The associations of chronic musculoskeletal pain with SPPB were estimated as odds ratios (OR) using binary logistic regression. We adjusted for age, sex, education, depression, body mass index, smoking, exercise, and alcohol consumption. We performed separate analysis according to age (<70 years/≥70 years).

Results: In total, 35% (1321/3746), reported chronic musculoskeletal pain on both occasions (Tromsø 4 and 6). Participants aged ≥70 years were more prone to report chronic musculoskeletal pain on both occasions in midlife compared to participants aged <70 years (39.3% versus 30.5%). The mean SPPB score was 11 (SD 1.7), with 13.5% scoring ≤9 on the SPPB. The participants who reported chronic musculoskeletal pain on both occasions (Tromsø 4 and 6) had higher odds of scoring ≤9 on the SPPB (adjusted OR 1.68, 95% CI 1.36-2.07) compared to the reference group (chronic musculoskeletal pain on 0-1 occasion). The association was stronger among participants <70 years than among participants ≥70 years (adjusted ORs 2.80, 95% CI 1.77-4.43 and 1.45, 95% CI 1.15-1.84, respectively)

Conclusions: Chronic musculoskeletal pain on two occasions in midlife was associated with increased odds of reduced physical performance at the age of 60 years or older. The association was strongest among participants <70 years old.

I3

Recognition overdue: Military health records and mortality of Norwegian ONUC veterans 1960–1964

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Introduction: The Congo Crisis and the Opération des Nations Unies au Congo (ONUC) are well-documented, yet Norwegian veterans who participated in the ONUC mission have received limited recognition. Moreover, reliable records identifying these individuals are lacking, and no epidemiological research has examined their long-term health outcomes.

Aims: As part of a Norwegian Ministry of Defence initiative, we examined the health records and mortality of veterans who served in ONUC from 1960 to 1964.

Methods: We manually searched personnel folders of ONUC veterans located in the National Archives in Oslo. After transcription and quality checks of the data, we employed descriptive statistics to examine the health records assessed before and after ONUC. We linked information from 640 veterans identified in the Norwegian National Population Register to the Causes of Death Registries to analyze their mortality. Standardized Mortality Ratios (SMRs) were calculated to compare the observed number of deaths among veterans to the expected deaths among all Norwegian men. Poisson regression analysis was used to compare mortality rates across different operation-related factors and expressed as relative risk.

Results: The average birth year of ONUC veterans was 1931 and the average deployment year was 1962, with deployment typically lasting 6 months. Most veterans served in the Air Force (59.4%). Their health profiles remained so following the operation and over the years. The SMR for all-cause mortality was 0.83 (95% CI 0.75-0.90) indicating lower mortality than the general male population. There was no elevated SMR for external causes (SMR 0.78, 95% CI 0.50-1.15). We did not find any operation-related factors that were associated with mortality.

Conclusions: To the best of our knowledge, this is the first epidemiological study using data from UN operations prior to 1978. While we experienced challenges in digitizing preserved paper-based health records for Norwegian ONUC veterans, we found that they generally had good health and lower mortality, suggesting a “healthy soldier effect.” Systematic follow-up for veterans is needed in order to preserve health data for future research and veteran welfare.

I4

The impact of transition from paper to electronic death records on use of garbage codes in The Norwegian cause of death registry 2018–2023

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Introduction: In 2018, electronic death certification was gradually introduced in the Norwegian Cause of Death Registry (NCoDR). Electronic certification was made mandatory from 2022. This may have affected the use and pattern of ill-defined death codes, so-called “garbage codes”, reported as the underlying cause of death.

Aim: This study aimed to assess whether the transition from paper to electronic certification changed the magnitude and pattern of garbage codes in NCoDR.

Methods: The analyses included all deaths with a registered underlying cause of death in the period 2018-2023 (n=248,225). A garbage code was defined according to the definition used by the Global Burden of Disease study. Trends and patterns of garbage codes were assessed and its association with type of certificate (paper/electronic) estimated using a modified Poisson regression model estimating relative risks with 95% confidence interval (CI) adjusting for sex, age at death and place of death.

Results: In the complete study period, 22.6% of the deaths were registered with a garbage code as the underlying cause of death. The probability of garbage was 21% lower in electronic compared to paper certificates (adjusted relative risk 0.79, 95% CI 0.78-0.80). This difference was stable over time and led to an overall decrease in the proportion of garbage codes with increasing use of electronic certifications. The decrease in garbage codes over time was mainly driven by more specific coding. The five most common garbage codes were I50 (Heart failure), J18 (Pneumonia, organism unspecified), I64 (Unspecified stroke), R96 (Other sudden death, cause unknown) and X59 (Accidental exposure to unspecified factor), accounting for more than one third of the garbage codes in the study period. The use of all of these, except for I50, were significantly lower in electronic compared to paper certificates, most notably so for J18 and I64.

Conclusions: The transition from paper to electronic certification led to an improvement in cause of death registration through a reduction in the use of garbage codes, although garbage codes remain a considerable problem. An electronic system can provide guidance and feedback to the certifying physician, thereby providing opportunities for further improvement in data quality.

I5

Temporal trends in IADL and the association with rural-urban residential location among elderly: The HUNT Study (1995–2019)

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Introduction: The population is ageing, particularly in rural areas. Population centralization is an ongoing trend, and around 20% of elderly have relocated in the past six years, mainly for health and housing reasons. IADL (Instrumental Activities of Daily Living) among elderly has improved. IADL has been shown to predict institutionalization, but its predictive value for other housing transitions remains uncertain.

Aims: To investigate temporal trends in IADL independence and differences between elderly residents in rural and urban areas, as well as residential stayers vs. movers.

Methods: Cross-sectional data from Trøndelag Health Study (HUNT) and register data on migration and residential location from Statistics Norway (SSB). The study sample comprises elderly (60+) who participated in HUNT2 (1995-1997, N=6324), HUNT3 (2006-2008, N=6208), or HUNT4 (2017-2019, N=9008). IADL is measured by nine self-reported questions on practical everyday tasks. The variable was dichotomized into IADL independence or some level of dependency. Residential location was classified by SSB as rural or urban. Residential structures were created by combining categories of residential location (distinguishing rural and urban residents) and residential mobility (comparing stayers with movers). Logistic regression models were performed.

Results: IADL independence improved from HUNT2 to HUNT4 (1995-2019) in both rural and urban areas, with greater gains in rural areas. IADL independence increased from 59% to 80% in rural areas and from 63% to 78% in urban areas. Elderly who moved from rural to urban areas within the last five years before HUNT4 had higher odds of being IADL dependent compared to rural stayers (crude OR 1.67, 95%CI 1.31-2.14, $p < 0.001$). Adjusting for sex and age, no significant difference in IADL was observed between rural stayers and rural-to-urban movers**.**

Conclusions: Improvements in IADL independence from 1995-2019 were most notable in rural areas. Unadjusted findings show that IADL dependent elderly are overrepresented among those moving from rural to urban settings before HUNT4, but this may be negligible in adjusted estimates. These findings have implications for health services and housing in a geographical context, supporting ageing in place in rural settings and preparing urban areas for an ageing population with functional needs.

I6

Intelligence in early adulthood and cause-specific mortality in 1.26 million Norwegian conscripts

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Introduction: Large-scale Nordic studies have established an inverse association between early-adult intelligence and cause-specific mortality, but prior research has been limited to male conscripts born in the mid-20th century. This has constrained understanding of generational trends, sex differences, and the contribution of specific cognitive abilities.

Aims: To examine the relationship between intelligence measured in late adolescence and cause-specific mortality in Norway by leveraging extended birth cohorts (1950–2004), the inclusion of female conscripts after 2010, longer follow-up, and newly available cognitive sub-scores.

Methods: We analyzed 1,263,737 Norwegian conscripts (6.8% female) born 1950-2004 who completed intelligence testing at ages 17-19. A sub-cohort of 310 190 had complete sub-scores (arithmetic, figures, word similarities). Mortality (n=50,842) was classified using ICD-9/10 codes, with follow-up from testing until death, emigration, or end of 2021. Competing risk models estimated associations between stanine intelligence scores and cause-specific mortality, adjusted for birth year, obesity, and height, and stratified by sex and testing periods.

Results: Higher intelligence was inversely associated with all mortality causes in men, with the strongest effect for drug-induced deaths (HR 0.71, 95% CI 0.70-0.72) In women, despite fewer deaths and shorter follow-up, the protective association was even more pronounced for drug- and alcohol-induced deaths. No consistent pattern emerged between specific cognitive abilities and mortality, though associations varied by cohort.

Conclusions: Intelligence in late adolescence is robustly protective against premature mortality, especially substance-related deaths, with stronger effects observed in women. These findings underscore the importance of considering sex and generational context in public health interventions targeting mortality risk.

J: Non-communicable diseases

J1

Can unsuccessful ART cycles be an indication of an increased risk of hypertension and cardiovascular disease among women? A Norwegian registry-linkage study

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Introduction: Whether women who experience unsuccessful ART cycles might have an increased risk of cardiovascular disease (CVD) is unknown.

Aims: To assess the association between the ratio of unsuccessful to total number of ART cycles a woman is exposed to and risk of CVD and hypertension.

Methods: We studied the risk of chronic hypertension (32,535 women) and CVD (32,938 women) according to the ratio of unsuccessful to total ART cycles among all women in Norway registered with their first ART cycle between 2009 and 2020. Unsuccessful ART cycles were defined as those that did not result in a live birth. The risk of the two outcomes was estimated by using Cox-proportional hazards regression adjusted for age at start of follow-up, education level, diabetes, PCOS, and endometriosis as time-fixed covariates, in addition to total number of ART cycles, parity, preeclampsia and preterm birth as time-varying covariates.

Results: Preliminary results indicated that there was no increased risk of hypertension (HR 1.01, 95% CI 0.93-1.09) or CVD (HR 0.88, 95% CI 0.87-0.99) per 30% increase in the ratio of unsuccessful to total number of ART cycles. Compared to the low exposure group (ratio of unsuccessful cycles 0–3%), women in the high exposure group (ratio of unsuccessful cycles 66–100%) had similar risk of hypertension (HR 0.90, 95% CI 0.70-1.16) and CVD (HR 0.71, 95% CI 0.49-1.04).

Conclusions: Women who experience a high ratio of unsuccessful ART cycles do not have an increased risk of hypertension or CVD. Our findings should be confirmed in larger study populations with longer follow-up time.

J2

An effective system for measuring NCD risk factors on population level: A pilot study in the Joint Action Prevent Non-Communicable Diseases Project

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Introduction: The Joint Action Prevent NCD (JA PreventNCD) project aims to reduce the burden of non-communicable diseases (NCD) in Europe through coordinated strategies on health determinants. The targets are effective policies, societal, and personal risk factors. Nationwide, representative data on time trends in joint NCD risk factors are missing. To address this gap, an effective, representative, yet simple and scalable system for monitoring risk factors is necessary.

Aim: This pilot study aims to develop and test the implementation of a system that uses the primary health care system to obtain data on individuals' NCD risk factors, with the possibility of integrating data into national health registries.

Methods: The pilot utilizes the Norwegian primary healthcare system and comprises four phases: (1) recruiting a representative sample of general practitioners (GPs) and populations in participating regions; (2) conducting consensus and training workshops for involved healthcare personnel; (3) collecting data using a harmonized protocol; and (4) performing evaluation and quality control in collaboration with other countries. Participation in the study is based on informed consent, and a random sample of 100-300 adults aged 18-70 will be invited to GPs' offices for measurements of blood pressure, HbA1c, blood lipids, height, weight, and hip- and waist circumferences. All measurements will be performed by trained personnel using standardized procedures adapted from the Tromsø Health Survey. Further details on the model will be presented at the conference.

Results: The pilot study will be conducted during the fall of 2025. The results will describe the implementation and evaluation of a system that integrates data collection into routine primary care and national health registers.

Conclusions: The pilot will assess the potential for a robust, harmonized system for collecting data on NCD risk factors for monitoring purposes that can be scaled up to include additional factors and specific populations across countries. Such monitoring efforts are essential for tracking progress towards the global NCD targets. The NCD risk factors may also be included as mandatory variables in health registries and thus increase the value and use of registry-based studies.

J3

Risk factor trajectories from age 30–60 years and the counterfactual risk of dying from a noncommunicable disease: A prospective cohort study of >20,000 men and women – The NCDNOR Project

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Introduction: Smoking, alcohol, and physical activity are associated with noncommunicable disease (NCD) mortality. However, few studies have estimated how different trajectories of these risk factors from early to late middle adulthood affect absolute NCD mortality risk using a prospective cohort design.

Aim: Estimate what the counterfactual risks of dying from NCDs and other causes would be if the entire study population had followed one risk-factor trajectory compared to another.

Methods: We pooled data from repeated Norwegian health studies, including adults (54% women) aged 30–39 at first assessment ("trajectory start") who contributed 2–7 repeated measures of smoking (cigarettes day^{-1}, n=25,271), alcohol (grams day^{-1}, n=21,238) and physical activity (4 categories from "sedentary" to "very active", n=25,250). We used Latent Class Mixed Models to identify trajectories, and flexible parametric survival models and regression standardization to obtain counterfactual estimates of cause-specific cumulative incidence from "trajectory end" (age 50–59) to a maximum age of 84–86 years (1 to 34-years of follow-up) for cardiometabolic diseases (cardiovascular diseases and diabetes), cancers, chronic respiratory diseases, and other causes.

Results: We found significant differences between four different trajectory scenarios for all risk factors. The largest differences were found for smoking, for which estimates suggest the following: Had everyone in the study sample been non-smokers from their 30s to their 50s (observed in 57% of the sample), their probability of dying from cardiometabolic disease, cancer, chronic respiratory disease, and other causes would have been 5.1% ([95% CI] 4.1, 6.2), 10.5% (8.4, 12.6), 0.0% (<-0.01, <0.01), and 13.8% (10.5, 17.2), respectively. Had they instead continuously smoked 10–15 cigarettes day^{-1} during the same period (observed in 18% of the sample), equivalent probabilities would have been 4.3 (2.8, 5.8), 12.2 (8.9, 15.4), 6.8 (3.1, 10.5), and 0.8 (-2.1, 3.7) percentage points higher, respectively. Thus, an estimated 29% of participants in the non-smoker scenario would have died, compared with 54% under continuous heavy smoking, with the entire excess attributable to NCD mortality.

Conclusions: We provide new insights into how different risk factor trajectories can affect the absolute risk of dying from NCDs. Results for alcohol- and physical activity will be presented at the conference.

J4

Changes in body fatness through adult life and subsequent cancer risk: A Norwegian life-course study

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Introduction: Obesity is a worldwide pandemic, with Norway being no exception. Comprehensive scientific reviews have shown that obesity is closely linked to several non-communicable diseases, including 13 different types of cancers (liver, kidney, breast [postmenopausal], colorectum, pancreas, gastric cardia, endometrium, ovary, gallbladder, oesophagus, thyroidea, meningioma and prostate). This study aims to assess whether age at onset of overweight/obesity, time lived with overweight/obesity, and body mass index (BMI) trajectories are associated with the risk of overall and specific obesity-related cancers.

Methods: Repeated measurements from participants in three population-based health surveys: the Tromsø Study (1974-2015/2016), HUNT (1984-2019) and the Norwegian Women and Cancer Study (NOWAC, 1991-2015) have been linked to the Norwegian Health Screening Service (1963-1989) and the Norwegian Armed Forces health register to extract information about the participant's BMI earlier in life. All databases have been linked to the Cancer Registry of Norway to identify incident cases of obesity-related cancer. Linear mixed effect models and group-based trajectory modelling are used to model BMI through adult life and Cox proportional hazards models are used to estimate hazard ratios for overall and specific obesity-related cancers in relation to the various measurements of body fatness.

Results: We will be able to analyze body fatness trajectories in 33,924 women and men from the Tromsø Study, 73,595 women and men from HUNT, and approximately 148,000 women from NOWAC. The Norwegian Armed Forces Registry and the Norwegian Health Screening Service enable us to follow the study population from around the 1950s up to 2018, depending on the timing of the last measurement in the population-based studies. More results will be presented at the conference.

Conclusions: Ongoing work, the conclusion will be presented at the conference.

J5

Exploring complex patterns of diagnosed mental-somatic multimorbidity among individuals with alcohol use disorder: A sex-stratified registry-based study

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Introduction: Alcohol use and alcohol use disorder (AUD) are leading causes of morbidity and mortality. While males are more often diagnosed with AUD, recent trends suggest that this gender gap is narrowing. Additionally, mental and somatic comorbidities are more prevalent among people with AUD relative to the general population, however, studies examining sex differences in the complex overlap between somatic and mental disorders among individuals with AUD remain relatively few.

Aims: To identify and compare common mental and somatic disorders and their multimorbidity patterns among individuals with AUD and matched controls, stratified by sex, and to explore the overall structure of these patterns using diagnostic network analysis.

Methods: We identified 67,358 individuals with AUD in the Norwegian Patient Registry (2008–2016) and an age- and sex-matched control group, all with specialist care diagnoses. The 20 most frequent mental and somatic diagnoses were identified among those with AUD for each sex, and prevalence compared across four groups. Odds ratios and Breslow-Day tests assessed sex differences within and between AUD and control groups. Multimorbidity patterns were explored using sex-stratified upset plots and correlation networks of common diagnoses, with diagnostic clusters identified via the Leiden algorithm.

Results: The AUD sample had higher levels of somatic and mental morbidity, with a greater burden among females as indicated by total number of diagnoses. Asthma and soft tissue disorders were more common in females than males with AUD, while gastro-esophageal reflux disease and other digestive disorders were more common in males, with sex differences exceeding those in the non-AUD group. Eating disorders and unspecified dementia were more common in females with AUD, and other substance use disorders in males, with these differences exceeding those in the non-AUD group. We identified sex differences in the most frequent patterns of multimorbidity, as well as differences in associations within the diagnostic networks, particularly between females with and without AUD.

Conclusions: Individuals with AUD exhibited substantial mental and somatic multimorbidity, with a higher burden among females. Distinct sex differences in diagnostic patterns and network structures highlight the importance of sex-stratified approaches in understanding and addressing multimorbidity in this high-risk population.

J6

Impact of education on noncommunicable disease risk in Norwegian adults: The role of risk factor clusters – The NCDNOR project

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Introduction: Higher education is associated with a lower risk of noncommunicable diseases (NCDs), but it is unclear how this varies across groups with different modifiable NCD risk factor profiles.

Aims: Using data included in the NCDNOR project, we (i) identified clusters of modifiable risk factors; (ii) estimated the total effect of tertiary versus primary education on the 10-year probability of first NCD, NCD multimorbidity and death; and (iii) estimated the controlled direct effect (CDE) of education on these outcomes while holding risk factor clustering membership fixed.

Methods: We included 42,930 individuals aged 30-60 years and living in Norway between 2009 and 2019 with no prior cancer, cardiovascular diseases (CVD), chronic obstructive pulmonary disease (COPD), or diabetes. NCDs were identified using primary and secondary healthcare data from mandatory national health registries. We used latent class analysis to identify risk factor clusters and multi-state models with inverse probability weighting to estimate 10-year probability differences.

Results: The overall probability of being alive with ≥1 NCD at 10 years was 23.4%. The 10-year probability was 4.5 percentage points (ppt) higher for primary (26.6%) versus tertiary education (22.1%). For multimorbidity, the equivalent difference was 1.6 ppt. 10-year NCD-specific probability differences ranged from 0 (cancer) to 3.2 ppt (COPD). By counterfactually fixing risk factor cluster membership to the clusters identified (n=5), we found that the 10-year probability differences for developing ≥1 NCD between primary and tertiary education ranged from 0.0 to 6.2 ppt: For diabetes, the probability differences were close to 0 ppt for all clusters except “obesity” (4.0 ppt); For cancer, the probability differences were close to 0 ppt for all clusters except “harmful use of alcohol” (-4.3 ppt); For COPD, probability differences were 2.8 ppt for “one risk factor”, 8.7 ppt for “inactive smokers”, and 4.8 ppt for “harmful use of alcohol”.

Conclusion: Higher educational attainment reduced the 10-year probability of NCDs in middle-aged Norwegian adults. This advantage remained even when modifiable risk factor clustering was held constant but differed by cluster and NCD. Results may suggest that policies that pair educational and cluster-specific lifestyle interventions are likely to yield the largest health gains.

K: Mental health

K1

Trends in mental health problems in the adult population in Norway: A compilation of data from population-based surveys

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Introduction: Mental health problems are one of the most important contributors to disease burden worldwide. Reliable estimates of the prevalence of people living with mental disorders, as well as those experiencing high levels of symptoms that may develop into disorders, are crucial for effective public health planning. While time-trends in mental health problems among children and adolescents are well-documented, less is known about long-term trends among adults.

Aims: We aim to synthesize data from large population-based cross-sectional studies in Norway to describe the development of symptoms of anxiety and depression in the adult population from 1995 to 2024. Multiple data sources enable detailed comparisons across different age groups, making it possible to identify those most affected by changes in mental health over time.

Methods: Representatives from all Norwegian repeated cross-sectional studies that measured symptoms of anxiety and depression in the general adult population (aged 18 +) were invited to participate. Data were extracted from the Living condition survey (1998-2012, and 2015-2019), HUNT (1995/97-2017/19), the Tromsø study (2001-2015/16), SAMINOR (2003/04-2012), Quality of life survey (2021-2024), FHUS (2020-2024) and the Student's Health and Wellbeing Study (SHoT, 2010-2022). From each study, we extracted data on items measuring symptoms of anxiety and depression, participants age and sex as well as year of measurement.

Results: Together, the studies comprise 29 separate cross-sectional data collections between 1995 and 2024. For each survey, we display the mean symptom scores and the proportion of individuals scoring above the defined cut-off levels for possible mental health problems across time, stratified by sex and 10-year age groups. Preliminary analyses indicate an increase in mental health problems among young adults, particularly young women. Among individuals in midlife, findings are more mixed, with most studies indicating stability or only minor fluctuations. In contrast, the mental health of older adults appears to have remained stable or even improved.

Conclusions: Preliminary analyses show divergent trends in mental health among adults in Norway, where mental health problems increase in young adults, while they remain stable or improved in old age.

K2

Comorbid mental disorders in students with disordered eating and eating disorders: One year follow-up after the SHoT study 2022, Norway

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Introduction: Eating disorders (EDs) are often associated with high levels of mental health comorbidities, including depression, anxiety and substance use disorders, further increasing complexity and severity. In recent years, there has been a dramatic rise in both general mental distress and EDs among post-secondary students. This study examines the mental comorbidity outcomes (major depressive episode, anxiety disorder(s) and substance use disorder) in students with disordered eating (DE) or EDs.

Methods: Data were drawn from the national Students' Health and Well-being Study (SHoT) in Norway, including 10 460 university and college students aged 18–36 who participated in SHoT2022. A diagnostic follow-up was conducted in 2023 using a self-administered electronic version of the Composite International Diagnostic Interview (CIDI 5.0). Logistic regression models were used to estimate odds ratios (OR) for the three outcomes, comparing students with and without DE or EDs at baseline.

Results: Students with DE or EDs at baseline had significantly higher odds of fulfilling the diagnostic criteria for a mental disorder one year later. In the ED group, 69% met criteria for a major depressive episode and 70% for an anxiety disorder, compared to 31% and 33%, respectively, in the ED-negative group. The strongest associations were observed for anxiety disorders, with adjusted ORs ranging from 1.8 to 4.7 depending on ED subtype. Feeling guilty about eating and comfort eating were also strong predictors of mental disorders, with ORs up to 3.0 for depression and 2.0 for anxiety.

Discussion: These findings suggest a substantial association between self-reported DE or EDs and mental comorbidity in a one-year follow-up. Mental health services should address a broad set of disorders, including EDs. Particularly, feelings of guilt and comfort eating might serve as important clinical indicators.

K3

Socioeconomic position and somatic comorbidity in mental disorders

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Introduction: Individuals with mental disorders face an elevated risk for somatic noncommunicable diseases (NCD), such as cardiovascular disease (CVDs), chronic obstructive pulmonary disease (COPD), diabetes, and cancer. Low socioeconomic position (SEP) is linked to both mental disorders and somatic NCDs, but its role in this association remains unclear.

Aims: Here, we provide a comprehensive overview of how associations between mental disorders and somatic NCDs vary by SEP indicators.

Methods: Data on all adult individuals resident in Norway from 01.01.2008 to 01.01.2010 (N= 3,589,719) were linked to several Norwegian nationwide registries, including registries on primary and secondary health care, dispensed drugs, causes of death, and socioeconomic variables. We assessed four broad types of mental disorders (psychotic, bipolar, depressive and anxiety disorders) and four categories of somatic NCDs (CVD, COPD, diabetes, cancer) diagnosed during follow-up from 01.01.2010 to 31.12.2020. Educational attainment and household income were used as SEP indicators, in addition to parental educational attainment. Cox regression models estimated hazard ratios for somatic NCDs among individuals with mental disorders compared to the general population, adjusting for and stratifying by SEP, sex, and age.

Results: All mental disorders were associated with an increased risk of somatic NCDs, strongest for COPD and weakest for cancer. Risk increased with disorder severity, with psychotic and bipolar disorders showing the strongest associations. Young adults with psychosis had a 4-5-fold increased risk of diabetes and COPD. Low SEP was associated with both mental disorders and somatic NCDs and contributed moderately to their co-occurrence, but with little variation across SEP strata.

Conclusions: We found an increased risk of somatic NCDs in individuals with mental disorders and identified young adults with psychosis as a particularly vulnerable subgroup. Low SEP compounds this burden, underscoring the need for integrated mental and somatic healthcare strategies.

K4

Solitary confinement and mental health disorders in Norwegian prisons

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Introduction: Solitary confinement is extensively used in Norwegian prisons, despite the well-known detrimental effects on morbidity and mortality. Furthermore, previous international research has suggested that mental health disorders among people in prison increase their risk of being placed in solitary confinement. This study will investigate the prevalence of pre-existing mental health disorders among people exposed to solitary confinement in prisons in Norway, and the risk of solitary confinement among people with pre-existing mental health disorders.

Aims: 1) Describe sociodemographic and criminogenic factors associated with solitary confinement 2) Describe the prevalence of mental health disorders among people experiencing solitary confinement during incarceration, 3) Describe the prevalence of solitary confinement for incarcerated people with mental health disorders, and 4) Investigate the risk factors (sociodemographic, criminogenic, and pre-prison mental health and substance use disorders) associated with solitary confinement

Methods: This is a retrospective longitudinal cohort study using registry data on solitary confinement and incarceration from the Norwegian Correctional Services, linked to information on mental health disorders from the Norwegian patient registry. We study a cohort of people incarcerated in Norway from 2015-2022 (n=35 210) and measure the prevalence of mental health disorder 5 years prior to incarceration. We define mental health disorders as receiving specialized health care services registered with a diagnosis from the F-chapter of the ICD-10. We performed Poisson regression analysis to estimate the incidence rate ratios, using days of solitary confinement as the count variables and nesting on personal ID.

Results: Pre-liminary results show a high prevalence of mental health disorders among people who experience solitary confinement. People with severe mental illness have a particular high prevalence of solitary confinement decided by the correctional services.

Conclusions: People with known mental health disorders have a higher risk of experiencing solitary confinement in prison. To reduce the use of solitary confinement and prevent the negative health consequences, correctional services and health care providers need to provide people with mental health disorders in prison with access to treatment and preventive efforts.

K5

Tic Talk – What happens during 10 years following a tic disorder diagnosis?

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Introduction: Tourette's syndrome and other tic disorders affect a significant number of children and adolescents, yet there is limited evidence on their long-term outcomes. Understanding the life prognosis for individuals diagnosed with these conditions is crucial for developing effective interventions and support systems. These disorders often co-occur with other neurodevelopmental conditions, which can exacerbate challenges in social, educational, and occupational domains.

Aims: This study aims to investigate the long-term outcomes of children and adolescents diagnosed with tic disorders, utilizing comprehensive merged registry data from Norway to assess their life trajectories over a ten-year period.

Methods: Analyses were conducted on all individuals aged five to seventeen who were registered as patients in Child and Adolescent Mental Health Services (CAMHS) during 2009-2010. Individuals diagnosed with tic disorders (n=2,658) were compared to a control cohort without CAMHS contact (n=80,100) on outcomes including educational attainment, employment, disability benefit receipt, child care orders, serious crime charges, victimization, inpatient mental health care, self-harm, addiction diagnoses or treatment, and mortality. Data was drawn from Norwegian public registers linking patient information with socio-economic background information on parents. Marginal predicted probabilities for outcomes were calculated using linear probability models with ordinary least squares estimation, adjusting for birth year with an interaction term between sex and diagnosis.

Results: Sixty-three percent of individuals with tic disorders had comorbid neurodevelopmental diagnoses, such as Attention-Deficit Hyperactivity Disorder and Autism Spectrum Disorder. Compared to the control cohort, individuals with tic disorders were more likely to experience adverse outcomes, including welfare dependence, serious crime charges, treatment for self-harm, and a higher need for foster care. This was particularly pronounced among those with comorbidities. Lower parental socioeconomic position was related to a higher risk of adverse outcomes. Forty-seven percent of boys and 42% of girls were in work or education ten years after their first CAMHS contact.

Conclusions: Young individuals diagnosed with tic disorders experienced a greater number of adverse outcomes compared to their peers. This is the first ten-year trajectory population-based study examining multi-outcome data following a tic disorder diagnosis.

L: Cancer

L1

Recurrence after diagnosis of primary cutaneous melanoma: Population-based risk prediction

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Introduction: The number of patients living disease-free after a cutaneous melanoma diagnosis is steadily increasing. Despite mounting pressure on healthcare systems, regular follow-up remains essential to detect recurrence at an early stage. However, the risk varies widely between individuals, and the factors predicting this risk of recurrence are not yet extensively studied.

Aims: To investigate patient and tumor characteristics predicting melanoma recurrence, and to develop a competing risk prediction model using data from national registries.

Methods: We included 28,071 patients diagnosed with primary melanoma with TNM stage below IV, during 2008-2021 in Norway, using data from the Cancer Registry of Norway, Norwegian Melanoma Registry, and Norwegian Patient Registry. A competing risk model assessed the cumulative hazard and the incidence rate of recurrence up to 10-years after diagnosis. Based on the Fine and Gray method, a model for predicting recurrence up to 5 years after diagnosis was developed based on patient and tumor characteristics and internally validated.

Results: Over 10-year follow-up, the recurrence was consistently higher in men than in women, and increased with age at diagnosis, even as the incidence of death concurrently rose. Tumor thickness, ulceration, body site, sex, and age were strong predictors of recurrence. Higher recurrence risk was observed in patients with melanoma located on the head/ neck, with ulcerated tumors, and tumors thicker than 4.00 mm. For example, among male patients aged 65 with an >2.0–4.0 mm thick ulcerated superficial spreading melanoma on the trunk, the predicted probabilities of recurrence were 12%, 23%, and 28% at 1-, 3-, and 5-years post-diagnosis, respectively. The 5-year prediction model demonstrated excellent performance, with optimal Brier scores ranging from 0.05 to 0.11 and optimal area under the curve (AUC) values between 0.76 and 0.81, indicating strong calibration and discrimination.

Conclusions: Our findings highlight tumor characteristics, including thickness, ulceration, body site, and patient's sex and age, as key predictors of recurrence within five years. The developed risk prediction model provides a valuable prognostic aid that can identify high-risk patients and optimize more personalized follow-up strategies for patients with melanoma.

L2

A cumulated incidence risk model for breast cancer – Balancing sex hormone risk factors versus pregnancy protection

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Introduction: One hundred years of epidemiological research on postmenopausal breast cancer has not lead to a holistic theory. Here is introduced a model balancing sex hormone risk factors versus the protection given by parity or each full-term pregnancy.

Methods: The analyses are based on the NOWAC study of 150 000 women in Norway and the 360 000 married women in the Norwegian 1960 Census, both with information on parity. Follow-up is based on linkages with the unique Norwegian person number to the Cancer Registry of Norway and national mortality register. Analyses were based on person-numbers of follow-up and cumulative incidence in NOWAC, and curvilinear logit models in the Norwegian 1960 Census.

Results: No effect modifications between each of the three sex hormone risk factors (body mass index (BMI), smoking and alcohol) and number of pregnancies were found based on cumulative incidence rates in NOWAC, range of parity 1-6 children. Each additional child increased BMI linearly from 1-10 children. In a logit analysis of breast cancer incidence and parity over the extended fertility range of 1-15 children in the 1960 Norwegian Census a strong curvilinear relationship was found with each additional child reducing the risk of breast cancer by 10.5% (95% confidence interval; 9.6-11.4). Age at marriage was used as proxy age at first birth, The effect of an early first birth was less than an additional child. Combining incidence according to parity over the extended fertility range with the underlying distribution of the study population (Census 1960) clearly demonstrated the high-risk distribution of the total Norwegian female population.

Conclusion: The individual risk of breast cancer can be viewed as a vector between sex hormone risk factors and parity in a model without effect modification. Currently, few if any studies can explore this relationship over the extended fertility due to the restriction of exposure range of parity, the most important factor.

L3

Four major anaerobe oral bacteria and respiratory diseases: A non-AI prospective cohort analysis

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Introduction: The oral cavity and the respiratory system are integrated and a closely knit anatomical system. The microbiological relationship is explored in this study.

Aims: Using the level of serum antibodies to four major oral anaerobe bacteria identified in chronic periodontitis, we explored their prediction for respiratory cancers, asthma, and bronchitis/emphysema.

Methods: Serum obtained in the Oslo II study in 2000 from a random sample of men with no history of cancer incidence (n=621) was analysed for antibodies by the ELISA method to three anaerobe bacteria of the so-called red complex *Tannerella forsythia* (TF), *Porphyromonas gingivalis* (PG), and *Treponema denticola* (TD), and in addition the facultative anaerobe *Aggregatibacter actinomycetemcomitans* (AA). Self-reported information on asthma and bronchitis/emphysema was obtained at the screening. Lung cancer incidence was provided by linkage to the Cancer Registry of Norway during the follow-up of 17 ½ years. The prospective analyses were performed using Cox proportional hazard regression analyses.

Results: All respiratory cancers numbered 23 in total, and bronchi and lung cancers separately numbered 18 during follow-up. Asthma was reported by 52 men, and bronchitis/emphysema by 23 men. Exposure was quartile levels of the antibody measurements for each bacteria. A significant increase in prediction was found in bronchitis for low levels (first quartile) of TD antibodies; $p = 0.035$. Low levels of TF and TD showed increased risk for daily smokers; $p = 0.030$ for TF and $p < 0.001$ for TD of the full study group. No association was found for PG or AA. An increased risk by any of these anaerobe bacteria was not observed for respiratory cancers.

Conclusion: The low IgG responses to these major oral bacteria, TF and TD, were associated with self-reported asthma and bronchitis/emphysema, but not observed for respiratory cancers. This is in contrast to our previous observations on cancer. This may be explained by a too low sample size or a genuine difference.

L4

Sex and age disparities in mortality risk among cancer patients with sepsis: A population-based study in Norway

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Introduction: Previous studies have shown that sepsis is associated with higher mortality in patients with cancer compared to those without. However, it remains unclear how this association varies by sex and age.

Aims: To investigate the association between cancer and hospital mortality in sepsis patients, stratified by sex and age.

Methods: We conducted a population-based cohort study including all patients aged ≥18 years hospitalized with sepsis in Norway from 2008 to 2021. Data were obtained from the Norwegian Patient Registry using ICD-10 codes. Multivariable log-binominal regression analyses were used to assess the association between cancer diagnosis and hospital mortality across subgroups of sepsis patients, stratified by sex and age.

Results: Of the 222,832 patients hospitalized with sepsis during the study period, 37 692 (16.9%) had a cancer diagnosis. Among cancer patients with non-metastatic disease, hospital mortality was 16.9% for males and 16.2% for females. For those with metastatic disease hospital mortality was 27.1% for males and 26.2% for females. The relative risk (RR) of hospital death was 1.39 (95% CI 1.34-1.44) for males and 1.63 (95% CI 1.55-1.77) for females with non-metastatic cancer and 2.27 (95% CI 2.18-2.37) for males and 2.75 (95% CI 2.62-2.89) for females with metastatic cancer, compared to non-cancer patients of the same sex. The association between cancer and hospital mortality was stronger among female sepsis patients compared to male sepsis patients in all age groups. Cancer patients younger than 50 years had the highest RRs of dying – RR=8.3X (95% CI 5.12-13.37) for metastatic cancer in female patients aged 18-39, and RR=5.9X (95% CI 4.43-7.97) for metastatic cancer in male patients aged 40-49, despite having a lower absolute mortality risk compared to older cancer patients.

Conclusions: Cancer patients with sepsis experience higher hospital mortality than their non-cancer counterparts, with the strongest association seen in females and young adults. Our findings underscore the need for further research into strategies to reduce mortality in cancer patients with sepsis and may inform future research on targeted sepsis therapies and underlying mechanisms contributing to mortality in specific patient subgroups.

L5

Menopausal hormone therapy and risk of ovarian cancer: Evidence from a population-based cohort of 1,274,576 women in Norway

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Introduction: In this cohort study, we investigated the association between use of menopausal hormone therapy (MHT) and epithelial ovarian cancer (EOC) risk.

Methods: We identified all women aged ≥45 years residing in Norway between 2004-2018. We obtained data on prescriptions, cancer and sociodemographic factors from national registries. Using multivariable Cox models, we estimated hazard ratios (HR) for the association between current use of MHT and EOC risk according to MHT type, administration route and individual drugs overall, and stratified by histological subtype and stage.

Results: We included 1,274,576 women, among whom 443,342 (34.8%) used MHT, and 4,796 (0.38%) developed EOC over a median follow-up of 12.7 years. Compared to no use, current use of any MHT was associated with an increased risk of EOC (HR 1.20, 95% confidence interval [CI] 1.11-1.30). We observed an increased EOC risk with current use of oral oestradiol combined with norethisterone (HR 1.32, 95% CI 1.15-1.50) and with vaginal oestradiol (HR 1.21, 95% CI 1.10-1.34), but not with non-vaginal oestrogen (HR 1.01, 95% CI 0.80-1.28 for oestradiol, HR 0.81, 95% CI 0.58-1.12 for estriol). In the drug-specific analyses of non-vaginal preparations, we observed an increased risk of EOC with current use of oral Activelle® (HR 1.42, 95% CI 1.18-1.69). Among vaginal preparations, we observed an increased EOC risk with current use of Vagifem® (HR 1.17, 95% CI 1.03-1.34 for the 0.010 mg Vagifem; HR 1.31, 95% CI 1.13-1.53 for the 0.025 mg Vagifem). Current use of any MHT was associated with a higher risk of high-grade serous EOC (HR 1.23, 95% CI 1.10-1.38). HR (95% CI) for the other subtypes of EOC were 1.00 (0.69-1.45) for endometroid, 0.54 (0.34-0.86) for mucinous, 1.11 (0.74-1.66) for clear cell, and 0.50 (0.27-0.94) for carcinosarcoma. HR (95% CI) for the stage-specific analyses were 1.08 (0.88-1.31) for localised, 1.39 (1.03-1.87) for regional, and 1.22 (1.12-1.34) for distant EOC.

Conclusion: Current use of MHT was associated with an increased risk of EOC, driven by the largest subtype, high-grade serous EOC. Among MHT components, oestradiol combined with norethisterone, and vaginal oestradiol showed increased risk of EOC, while non-vaginal oestrogen did not.

M: Pharmacology

M1

Temporal trends in opioid dispensing among Scandinavian children, adolescents, and young adults from 2010 to 2024

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Introduction: Opioid analgesics are essential for managing moderate-to-severe acute and cancer-related pain. Population-based research on opioid utilization in pediatric and young populations remains limited. The use of codeine and tramadol—particularly in children under 12—is discouraged due to safety concerns, but real-world utilization is unknown.

Aims: To examine trends in opioid dispensing among children, adolescents, and young adults in Scandinavian countries from 2010 to 2024.

Methods: This repeated cross-sectional study used publicly available drug use statistics on opioid analgesics (ATC group N02A) dispensed to individuals aged 0–34 in pharmacies in Denmark, Norway, and Sweden. We assessed annual changes in opioid utilization across three age groups (0–14, 15–24, and 25–34 years) using one-year prevalence (users/1,000 inhabitants/year) and amounts dispensed in morphine milligram equivalents (MME)/1,000 inhabitants/day.

Results: From 2010 to 2024, Norway had a consistently higher prevalence of opioid users across all age groups, with relatively stable rates except for a decline in the 0–14 age group. In addition, Norway showed the highest amounts of opioids dispensed in MMEs, with increasing use in the youngest age group. In Denmark, one-year user prevalence and opioid volumes in MMEs decreased across all age groups, except for an increase in user rates in the 0–14 age group, which nevertheless remained low compared to Norway and Sweden. Sweden showed declining use in all age categories, both in terms of one-year prevalence and MMEs dispensed. In the 0–14 age group, codeine and tramadol formulations were rarely used in all three countries (< 1.2 users/1,000/year). Morphine in Denmark and oxycodone in Sweden were the most frequently used opioids in all age groups, while codeine-paracetamol was predominant in Norway. In Norway, the prevalence of tramadol users increased across all age groups.

Conclusions: There are substantial differences in total opioid use and substance-specific prescribing patterns across the three Scandinavian countries, despite similar socio-demographic profiles and healthcare systems. Denmark and Sweden tend to favor strong opioids in young populations, while codeine-paracetamol remains relatively common among adolescents and young adults in Norway.

M2

Trends in the use of antipsychotic drugs in Scandinavian countries from 2010 to 2023

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Introduction: Antipsychotic use has increased beyond their primary uses for schizophrenia and bipolar disorder, but current data on trends and dosages in Scandinavia are lacking.

Aims: To examine trends in prevalence and dosing of antipsychotic drugs in Scandinavia between 2010 and 2023.

Methods: Data on antipsychotic use from 2010 to 2023 were obtained from national prescription registers in Norway, Sweden, and Denmark. For each antipsychotic drug class, we calculated: one-year prevalence (users per 1,000 inhabitants), therapeutic intensity (TI; Defined Daily Doses [DDD] per 1,000 inhabitants per day), and mean dose (MD; DDD per user per day), overall, by sex, and across age groups (0–14, 15–24, 25–44, 45–64, 65–74, 75+).

Results: From 2010 to 2023, antipsychotic use increased in all Scandinavian countries, with Sweden (+24.8%) and Norway (+23.3%) showing the largest rises, and Denmark (+7.2%) the smallest. Use was most common among women and those aged 25–44, driven mainly by a rise in SGAs, especially quetiapine. Over 13 years, quetiapine's TI increased (e.g., Norway from 1.29 to 2.96), while its MD decreased (Norway from 0.63 to 0.18), indicating a shift toward low dose prescribing. By 2023, 33% of quetiapine prescriptions in Norway lacked documented clinical justification.

Conclusions: From 2010 to 2023, Scandinavian countries experienced significant shifts in antipsychotic prescribing patterns, with a rising prevalence of SGAs, increased therapeutic intensity, and decreasing mean doses for most drugs. These trends were most pronounced for quetiapine and likely driven by off-label use. There is an urgent need for ongoing surveillance and studies linking prescription records to clinical data to improve safety and promote evidence-based practices.

M3

Psychoactive medication use and risk of severe injury: a registry-based nested-case control study

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Introduction: Accidental injuries accounted for around 57 million years lived with disability worldwide in 2017 and are a major cause of death. Psychoactive medications such as benzodiazepines and opioids affect the central nervous system and can thereby increase the risk of injuries and physical trauma.

Aims: We aim to investigate the impact of pre-injury use of benzodiazepines and opioids on the risk of physical trauma.

Methods: The Norwegian Trauma Registry (NTR) includes all patients admitted to hospitals with suspected severe injury. We included patients registered in NTR during 2015-2018 (n=26,577) along with healthy controls (n=256,907) matched 1:10 on sex and birth year, sampled with incidence density sampling with replacement, according to a nested case-control study design. Exposure and covariate data have been obtained from the Norwegian Prescription Database, the Norwegian Patient Registry, the Norwegian Control and Payment of Health Reimbursements Database, and Statistics Norway. To study how benzodiazepines (ATC codes: N05BA; N05CD; N03AE01) and opioid analgesics (ATC code: N02A) relate to trauma, we will apply conditional logistic regression adjusted for relevant covariates including comorbidity and socioeconomic status.

Results: Among the trauma patients, the median age was 41 years, and 67.3% were men. In the period of 30 days prior to the trauma incident, 3.9% of the cases had dispensed benzodiazepines vs. 1.4% of the controls. The corresponding proportions for opioids were 4.3% for the cases and 2.3% for the controls. Among the cases with dispensed benzodiazepines within 30 days before trauma, the median number of defined daily doses (DDDs) was 25.0 (IQR 10.0-50.0) vs. 20.0 (IQR 9.8-40.0) for controls. For opioids, the median DDD was 15.0 (IQR 6.7-27.4) among the cases, and 12.5 (IQR 5.6-25.0) among the controls.

Conclusions: Preliminary findings showed that benzodiazepines and opioids were more commonly dispensed among trauma patients compared to controls in the 30-day period before trauma. Among those having dispensed medications, cases dispensed larger amounts for both medication groups. Our study, using national registry data, may reveal important insights related to the effect of psychoactive medications on physical trauma.

M4

Comirnaty vaccine effectiveness in pregnancy: Emulating trial NCT04754594 using observational data from Norwegian health registries

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Introduction: Observational studies are pivotal when real-world evidence on effectiveness and safety is necessary for public health interventions and clinical decision-making. Existing observational studies on the Comirnaty (BNT162b2 mRNA) COVID-19 vaccine in pregnancy differ in design to the NCT04754594 trial, making it difficult to draw strong causal conclusions.

Aims: To estimate the real-world effectiveness of Comirnaty in pregnancy by emulating trial NCT04754594 and evaluating the accuracy of causal inference for vaccine effectiveness in pregnancy based on observational data.

Methods: Using nationwide Norwegian health registry data, we sequentially emulated NCT04754594 by applying similar eligibility criteria. In the intention-to-treat (ITT) analysis, we included pregnancies from 2021–2022 where the first dose of Comirnaty was given between gestational weeks 24 and 34, assuming the second dose followed within 21 days. A per-protocol (PP) analysis was also conducted, including only those who received both doses. Outcomes assessed were SARS-CoV-2 infection and severe COVID-19 (leading to hospitalization) within one month postpartum. Vaccinated individuals were compared to unvaccinated, propensity score–matched controls based on multiple covariates and the calendar date of the last menstrual period. We estimated pooled incidence rate ratios (IRRs) and 95% confidence intervals using modified Poisson regression with robust variance estimators.

Results: Among 6,752 eligible pregnancies (3,376 first dose vaccinated; 3,376 unvaccinated), the median maternal age was 31 years (IQR 6) and the median pre-pregnancy BMI was 23.9 (IQR 5.8). The ITT analysis showed a 35% reduction in SARS-CoV-2 infection risk up to one month postpartum (IRR 0.65, 95% CI 0.42–0.89), whereas the PP analysis showed a 46% risk reduction (IRR 0.54, 95% CI 0.27–0.80) compared to 41% in the NCT04754594. Due to the rarity of severe COVID-19 in our population, this outcome could not be reliably assessed. The small standardized difference (0.12; <1.96) between the emulation and trial estimates supported consistency between the two.

Conclusions: Real-world data from Norway confirm the effectiveness of Comirnaty in pregnancy, aligning with the original trial's findings. This supports the utility of target trial emulation for evaluating vaccine effectiveness in pregnant populations.

P: Poster presentations

P1

Harmonizing a monitoring system for physical activity, sedentary behavior, and sleep in working age adults across seven European countries: A pilot study in the Joint Action Prevent NCD project

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Introduction: The Joint Action Prevent NCD (JA PreventNCD) project is the EU's largest health promotion and disease prevention project to date, with overall aims to reduce the burden of non-communicable diseases (NCD) in Europe through coordinated strategies on health determinants. JA PreventNCD is divided into a total of ten work packages, and this pilot study lies within Work Package 8 – aiming to enhance European monitoring systems for NCD risk factors.

Aims: To harmonize accelerometer-measured physical activity (PA), sedentary behavior (SB), and sleep in population-based samples of working aged adults in seven European countries using a standardized protocol.

Methods: The Norwegian part of this pilot study is coordinated by the Department of Chronic Diseases at the National Institute of Public Health in Oslo. A random sample of 20-69-year-old men and women from the Oslo and Akershus counties will be invited, aiming to recruit 1000 participants. Two tri-axial accelerometers (Axivity AX3) will be used to measure PA, SB, and sleep, one placed at the right hip (waking hours) and one at the non-dominant wrist (24/7). The participants will be asked to wear the devices for seven consecutive days. For a wear day to be considered valid, we will test different minimum wear time criteria to get the best compromise between sample size and measurement reliability. A minimum of four valid wear days will be required – including at least one weekend day. The number of steps, and time spent sedentary and in light, moderate, and vigorous intensity PA, respectively, will be calculated using published cut-points validated in working aged adults, using the GGIR package in R. Demographic information, along with self-reported health, diet and supplementary information on PA and SB will be collected through a standardized questionnaire.

Results: The data collection will be completed before the 4th quarter of 2026, with a final report of the pilot to be delivered by March 31st, 2027. Success will be evaluated based on participation rate, percentage valid data, time consumption and manpower requirements.

Conclusions: If successful, this project has potential to be scaled up to a harmonized surveillance system for these key health determinants across Europe.

P2

Familial cross-recurrence risks of perinatal outcomes and neurodevelopmental disorders

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Introduction: Neurodevelopmental disorders (NDDs), such as attention-deficit/hyperactivity disorder (ADHD), epilepsy, autism spectrum disorder (ASD) and cerebral palsy (CP), are diagnosed in more than five per cent of Norwegian adolescents. However, the underlying causes of these disorders remain poorly understood. In this study, we explore potentially shared vulnerability factors for NDDs, psychiatric disorders, perinatal death and low Apgar score through sibling analyses.

Aim: Investigate shared underlying factors for NDDs, psychiatric disorders and adverse perinatal outcomes by assessing recurrence and cross-recurrence risks in siblings.

Methods: Norwegian national registries were linked and used to assemble a cohort of 1.3 million singleton sibling pairs born between 1967 and 2019. Stillbirths, neonatal deaths and newborns with five-minute Apgar scores below six were identified. Next, we identified sibling pairs in which the youngest sibling was diagnosed with CP, epilepsy, intellectual disability, ASD, ADHD, bipolar disorder or schizophrenia. Log-binomial regression models were used to estimate recurrence and cross-recurrence risks for the perinatal outcomes and NDDs or psychiatric disorders.

Results: Siblings of individuals who were stillborn, died neonatally or had low Apgar scores had increased risks of these perinatal outcomes and CP. In general, the recurrence risks were higher than cross-recurrence risks. Adjusted relative risks ranged from 1.6 (95% CI 1.1-2.2) for the association between low Apgar score in the oldest sibling and stillbirth in the youngest sibling, to 5.5 (95% CI 4.5-6.7) for recurrence of neonatal death. Additionally, siblings of stillborns had an increased risk of epilepsy (RR 1.2, 95% CI 1.0-1.4), intellectual disability (RR 1.4, 95% CI 1.2-1.7), ASD (RR 1.3, 95% CI 1.0-1.6) and schizophrenia (RR 1.4, 95% CI 1.1-1.8).

Conclusion: Adverse perinatal outcomes may share vulnerability factors with several NDDs, particularly CP, and schizophrenia as these conditions show increased cross-recurrence risks within families.

P3

Trends in adolescent overweight and obesity in 30 European countries 2002–2022: Results from the Health Behaviour in School-Aged Children Study

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Introduction: Overweight and obesity in children and adolescents have become a global public health challenge, making it vital to examine prevalence, trends, and socioeconomic factors within Europe to inform targeted interventions and reduce health inequalities.

Aims: To examine trends in overweight and obesity in European adolescents.

Methods: Cross-sectional data from the WHO collaborative Health Behaviour in School-aged Children (HBSC) study were used to assess self-reported height and weight and socioeconomic status from nationally representative samples of adolescents aged 15 in 30 countries. Multilevel regression analysis was used to examine linear trends in overweight and obesity in six survey rounds from 2002 to 2022.

Results: In 2022, overweight and obesity prevalence ranged from 12.2% in the Netherlands to 24.7% in Canada and increased overall from 2002 to 2022 (RR 1.09, 95% CI 1.08-1.10). The rise was steeper in lower SES groups (low: 1.13; medium: 1.10; high: 1.05; $\chi^2(2) = 39.02$, $p < .001$) and was most pronounced in Eastern European countries ($\chi^2(29) = 279.39$, $p < .001$), while SES-related trends did not differ significantly between countries ($\chi^2(58) = 63.97$, $p = .275$).

Conclusion: The study highlights a significant rise in adolescent overweight and obesity across Europe (2002–2022), with the sharpest increases in Eastern Europe and among lower SES groups, underscoring the need for targeted public health interventions.

P4

Validating clinical assumptions for characterizing prostate cancer aggressiveness utilizing historical cancer registry data

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Introduction: The prognosis of prostate cancer is highly dependent on disease characteristics at diagnosis. Etiologic risk factors may also differentially associate with such characteristics, but missing data on TNM and Gleason score to classify disease aggressiveness may obscure potentially causal relationships.

Aims: This study aimed to develop and validate a set of clinical assumptions to infer values for missing clinical TNM and Gleason scores for improved classification of aggressive and non-aggressive disease.

Methods: 17,542 males in the Norwegian Janus Serum Bank cohort diagnosed with incident prostate cancer from 1974–2022 were included. Clinical assumptions for aggressivity based on published literature and treatment guidelines were validated using positive predictive values (PPVs) among men with non-missing data and long-term prostate cancer-specific mortality. Cases were classified as aggressive (cT4, N1, M1, or Gleason score ≥8) or non-aggressive (complete information without aggressive features) both with and without the application of the clinical assumptions.

Results: 14 clinical assumptions for inferring cTNM or Gleason score were developed and validated, 8 of which had a PPV > 95%. Applying all clinical assumptions halved the proportion of cases with unclassifiable aggressivity from 60% to 28%. Cumulative mortality 15 years after diagnosis was similar for cancers previously known to be aggressive (42.6%, 95%CI: 40.5 to 44.8) and for cases assumed to be aggressive based on clinical assumptions (45.1%, 95%CI: 41.6 to 48.7).

Conclusions: Clinical assumptions based on available information can compensate for missing TNM and Gleason scores and substantially improve the classification of aggressive and non-aggressive prostate cancer. This major advancement in disease classification is crucial for identifying etiological risk factors associated with prostate cancer.

P5

The Problem Areas In Diabetes (PAID) scale: A registry-based study applying IRT analyses to compare information provided on diabetes distress when using PAID-20 or the short forms PAID-11 and PAID-5

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Introduction: The emotional impact of living with type 1 diabetes (diabetes distress) is well acknowledged but often unrecognized and/or underreported in diabetes care. Therefore, it is recommended to systematically assess diabetes distress in clinical diabetes practice. The Problem Areas In Diabetes (PAID) scale is one of the most commonly used Patient-Reported Outcome measures to assess diabetes distress. Also, shorter versions of the original 20-item PAID (PAID-20) have been suggested and tested. Both PAID-11 and PAID-5 with respectively 11 and 5 items from the original PAID-20, have shown satisfactory psychometric properties in traditional validation studies. However, no studies have explored the possible information lost about diabetes distress when using one of the short forms and no studies have evaluated the performance of each PAID item.

Aims: To 1) evaluate information provided on the latent diabetes distress trait when using the PAID-20, PAID-11 or PAID-5, and 2) evaluate the information provided by each scale item.

Methods: Using nationwide registry data from 10,190 individuals with type 1 diabetes in Norway, we applied Item Response Theory (IRT) analyses to compare test information curves for PAID-20, PAID-11, PAID-5 and their scale items.

Results: The test information curve for PAID-20 captured an overall broader range of the latent distress trait compared to the other versions. At test information level ≥10, the ranges (SD under/above mean) were: PAID-20: -1.30 to 3.32; PAID-11; -1.17 to 2.76; and PAID-5: -0.59 to 2.27. Six PAID-20 items had flat information curves with limited contribution to the latent trait, whereas the PAID-11 included 11 of the 12 items most frequently reported as serious problem areas.

Conclusions: The PAID-20 captures most information on the latent diabetes distress trait, but includes items with limited contribution. PAID-11 also provides satisfactory information and includes items that gave satisfactory information and captures the most serious problem areas. The PAID-5 covers limited aspects of distress. Overall, the PAID-11 appears to be a good choice for assessing diabetes distress in both research and clinical practice.

P6

Medication use trajectories in myasthenia gravis pregnancies: A drug utilization study

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Introduction: Myasthenia Gravis (MG) is an autoimmune neuromuscular disease often requiring medication during pregnancy. Unnecessary medications should be avoided to minimize fetal exposure, but inadequate immunosuppression could exacerbate symptoms. The disease course is unpredictable during pregnancy, and medication needs vary with the severity of MG. Therefore, medication use trajectories may indicate disease severity during pregnancy.

Aims: To describe MG-medication use before, during, and after pregnancy in a population-based MG-cohort.

Methods: This drug utilization study was based on nationwide linked health and population registers from Norway and Sweden, harmonized and pooled to create one cohort. We identified mothers with MG from Medical Birth Registries, Prescription Databases and National Patient Registries, requiring multiple MG diagnoses or pyridostigmine prescription fills before delivery. We included all MG-pregnancies from 2010–2020 in Norway and 2008–2019 in Sweden, lasting ≥22 weeks. For each 3-month period from 12 months before to 6 months after pregnancy, we determined the use of three classes of MG-medications: symptomatic medication (pyridostigmine), oral corticosteroid therapy, and non-steroidal immunosuppressant therapy (NSIST). With Group Based Multi-Trajectory Modelling, an unsupervised clustering method, we identified four distinct medication use trajectories before the delivery. Clinical characteristics, including hospital encounters (admissions and outpatient visits) and postpartum medication use, were assessed by the trajectory groups.

Results: We identified 277 MG-pregnancies from a background population of 1,960,755 pregnancies. No MG-medications were used in relation to 114 (41%) of these pregnancies (MG in remission). Mild, stable MG was observed in 58 (21%) pregnancies based on regular, infrequent refills of low-dose pyridostigmine only. Regular, frequent refills of medium-high dose pyridostigmine, without regular immunosuppressant use, characterized 62 pregnancies (22%; symptomatic MG). NSIST continuation into pregnancy, often combined with pyridostigmine and/or corticosteroids, characterized 26 pregnancies (9%). Medication use decreased markedly during pregnancy among these, indicating well-controlled MG. NSIST-users had the lowest number of hospital encounters during pregnancy but the highest postpartum, with many reinitiating NSIST postpartum. Regular corticosteroid use was observed in 17 pregnancies (6%). This group had increased corticosteroid-use during pregnancy and the highest number of hospital encounters during pregnancy.

Conclusions: Medication use trajectories can inform about real-world medication patterns and act as proxies for disease severity.

P7

AI-driven handwriting recognition for digitalization of health data from paper questionnaires

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Introduction: Health data from questionnaires is a backbone of epidemiological research using data from cohorts and other study designs. Today, data collections are done digitally, but excessive amounts of data are still available only in paper format. Currently, the price of processing 50.000 2-page questionnaires using market solutions, including scanning and translation of medication names to ATC codes, would be at least 1,5 MNOK.

Aims: This project aims to provide a cost-effective solution for digitalizing health- and medication data from hand-written questionnaires frequently used in cohort studies, within the framework of Norwegian data protection regulations.

Methods: In the Norwegian Women and Health (NOWAC) study, 42.000 out of 50.000 2-page paper questionnaires remain unprocessed. For digitalization we used Visual Language Models (VLM) to process checkboxes, and Computer Vision libraries (CV) to process handwritten numbers and text, such as medication names. In the pilot phase, the method was designed and tested using mock questionnaires on three different computers, and all the code was run locally without an internet connection. Results were compared to those of 8000 manually processed questionnaires.

Results: Preliminary results from the pilot are promising, and include metrics of the methods, data quality, and the cost of AI-driven handwriting recognition compared to manual processing of questionnaires. However, running the model on all 50.000 questionnaires in the Norwegian Service for Sensitive Data (TSD) has so far been hindered by lack of access to Graphics Processing Units (GPU) within TSD.

Conclusions: The pilot phase has yielded promising results. However, when processing the full collection of 50.000 questionnaires, all data will have to be kept within TSD. For the time being, the Norwegian framework for approved handling of sensitive data remains a considerable bottleneck for cost-effective digitalization of health data, as the appropriate computerization resources are currently not available for researchers.

P8

Risk of acute somatic hospital admissions among seafarers: A registry-based study in Norway

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Introduction: Medical certification is used to assess the fitness of seafarers for work at sea, yet little is known about the prognostic value of these assessments for future health outcomes. Given the unique occupational risks and barriers to timely healthcare access in maritime settings, understanding predictors of acute somatic illness is important.

Aims: To examine whether seafarers who received a time-limited health certificate or a declaration of unfitness had a higher risk of acute somatic hospital admissions compared to those who received a full health certificate.

Methods: This registry-based nationwide cohort study included all seafarers aged 18–70 years who underwent medical examinations in Norway between 2018 and 2019 (n=43,758). Health outcomes were linked to acute somatic hospital admissions over a 24-month follow-up using data from the Norwegian Patient Registry. Hazard ratios (HRs) for hospital admissions were estimated using Cox proportional hazards models in two follow-up intervals: 0–3 months and 3–24 months. Models were adjusted for age, gender, education, and centrality of residence.

Results: Compared to seafarers who received full health certificates, those declared unfit had substantially elevated risk of acute hospital admission in both time periods: 0–3 months (HR 5.13, 95% CI 3.27–8.04) and 3–24 months (HR 2.63, 95% CI 2.07–3.34). Seafarers who received time-limited certificates also had increased risk: 0–3 months (HR 2.02, 95% CI 1.39–2.93) and 3–24 months (HR 2.45, 95% CI 2.15–2.79). Adjustment for sociodemographic factors did not substantially alter the effect estimates.

Conclusions: Seafarers who receive a declaration of unfitness, as well as those who receive time-limited health certificates, face a significantly higher risk of acute hospital admissions compared to seafarers who receive full health certificates. These findings highlight the importance of medical certification to identify individuals at risk of future somatic illness and to ensure safety at sea.

P9

Post-deployment mortality from violent causes among 41,170 Norwegian male veterans from International Peacekeeping Missions

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Introduction: Despite the fact that military personnel are selected for service on the basis of good physical and mental health and typically show lower all-cause mortality than the general population, studies show increased mortality from violent causes among soldiers after completing service in conflict areas.

Aims: To assess post-discharge mortality from violent causes, inclusive of accidents, in a cohort of 41170 Norwegian male military peacekeepers.

Methods: The cohort was established by the Norwegian Armed Forces Health Registry and comprise virtually all Norwegian military men who participated in international peacekeeping missions between 1978 and 2023. The cohort members were followed-up for violent-cause deaths after discharge from peacekeeping service through 2023. We calculated standardized mortality ratios (SMRs) by dividing the observed numbers of deaths with the expected numbers calculated from national population rates in Norway, for the whole follow-up and for the first 5 years, and 5+ years post-discharge separately.

Results: We observed a total of 577 violent deaths during the overall study period, which was close to the expected number (SMR 0.98). The SMR was elevated during the first 5 years (SMR 1.19) and slightly lowered during the rest of the follow-up (SMR 0.93), a pattern also seen for accident-related mortality, inclusive of accidental falls. Mortality from transport accident was elevated throughout the full follow-up but the risk was particularly high during the first 5 years (SMR 1.54). The risk of death by accidental poisoning was half that of expected during our study period (SMR 0.53), and was particularly low in the first 5 years (1 observed vs. 16 expected).

Conclusions: Our study found an elevated risk of mortality from violent causes during the first 5 years after discharge from service in international peacekeeping operations, due to high risk of death by transport accidents. Previous studies among war veterans observed that risky driving was associated with increasing exposure to traumatic events during deployment. Such exposure is probably more important than military selections before deployment, but self-selection of risk takers into peacekeeping service might also have contributed to our results.

P10

Childhood socioeconomic position and later-life mortality: A linked study from the Historical Population Register of Norway and The Tromsø Study

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Introduction: Low socio-economic position in child- and adulthood (CSEP) is associated with increased risk of illness and early death. In Norway, most research on CSEP and health is based on data from 1960 onwards, by using the modern Population Register. The Historical Population Register of Norway (HPR) is a national database under construction compiling data from historical censuses and church books covering the period 1801-1964. By linking historical censuses, it is possible to study individuals across and between generations. Thus, HPR yields unique possibilities for in-depth studies of trends in SEP including familial transmission.

Aims: In this study, we aimed to examine whether there is an association between parental socioeconomic status and their children's health in later adulthood, that is, at age 50 and above.

Methods: We investigated the relationship between HPR-registered parental occupation and later-life health by linking HPR to a longitudinal population-based health survey, the Tromsø Study 1974-2016, Northern Norway. Cox proportional hazards models and (ordinal) logistic regression were used to investigate the associations between fathers' occupation in 1950 and all-cause mortality (n=7,056), as well as chronic disease prevalence and self-rated health (n=4,576) at age 50 and older among the Tromsø Study participants born between 1930 and 1955.

Results: Prospectively measured CSEP was associated with later-life health, although to a varying degree depending on the health indicator under study. Self-rated health showed the strongest association with CSEP and a clear social gradient that was more pronounced among women. We found only minor differences in all-cause mortality and varying patterns for prevalence of chronic diseases by CSEP. High CSEP was associated with lower prevalence of chronic respiratory diseases for both women and men, and higher odds for cancer among women.

Conclusions: This study contributes to the health inequality literature which aims to exploit new opportunities for record linkage across the life-course. Self-rated health is a subjective measure that captures physical, mental, and social aspects of health. Social inequalities in self-rated health can be explained by differences in both childhood conditions and socioeconomic circumstances in adulthood, which in turn influence lifestyle, working conditions, mental health, and other factors.

P11

Sexual dysfunction in men with obstructive sleep apnoea: The role of daytime sleepiness in a population-based study

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Introduction: Sexual dysfunction is common in middle-aged and older men and may be underrecognized in those with obstructive sleep apnoea (OSA), particularly when accompanied by excessive daytime sleepiness (EDS), which is increasingly associated with adverse health outcomes in OSA.

Aims: To assess the association between sexual dysfunction and OSA, focusing on subjective sleepiness and risk of dozing, in a population-based sample of middle-aged and older men.

Methods: Cross-sectional analysis of data from the Respiratory Health in Northern Europe (RHINE) cohort. Population-based, multicentre study conducted in Tartu (Estonia), Reykjavik (Iceland), Bergen (Norway), and Aarhus (Denmark). A total of 1,700 men (mean age 61.0 years; SD 6.7) who completed the Aging Males' Symptoms (AMS) questionnaire and provided data on OSA symptoms and relevant covariates were included. Moderate to severe symptoms of sexual dysfunction was defined by the AMS scale: decreased morning erections, reduced sexual performance, and decreased libido. Participants were categorized by OSA diagnosis and by the Multivariable Apnoea Prediction (MAP) index (>0.5 = high risk). Sleepiness was defined by the Epworth Sleepiness Scale (ESS score >10 = “risk of dozing”) and subjective report of “feeling sleepy” ≥3 days/week. Four sleepiness phenotypes were identified: non-sleepy, risk of dozing only, feeling sleepy only and both. Associations were examined using multivariable logistic regression adjusted for age, BMI, smoking, diabetes, hypertension, cardiovascular disease, and study centre.

Results: Sexual dysfunction was significantly more prevalent among men with diagnosed or suspected OSA. Subjects with suspected OSA based on MAP and reporting “both risk of dozing and feeling sleepy” had the highest odds of sexual dysfunction (ORs up to 4.10; 95% CI 2.27-7.38). Weaker or no significant associations were observed for snoring, snorting/gasping, or reporting “risk of dozing only” without subjective sleepiness.

Conclusions: Subjective sleepiness is strongly associated with sexual dysfunction in men with OSA, independent of traditional cardiometabolic risk factors. Assessing sleepiness phenotypes may improve recognition of clinically significant OSA in men presenting with sexual health concerns.

P12

Potentially modifiable risk factors for dementia in Norway: The HUNT4 70+ study

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Introduction: The 2024 Lancet Commission report on dementia identified 14 modifiable dementia risk factors. Since the Norwegian HUNT Study uniquely includes all 14 risk factors in the same individuals throughout adulthood and a study-specific dementia diagnosis, we evaluated the potential for dementia prevention of the 14 risk factors, plus three additional sociodemographic risk factors in this prospective cohort.

Methods: Data from 9745 participants aged 70+ years from the HUNT4 70+ Study (2017-2019), with study-specific dementia diagnosis were included. The study sample was linked with national administrative registries (1960-2018) and earlier HUNT surveys (1984-2008) with data on risk factors at ages 35-92 years. Inverse probability weighting was applied to account for non-response, and regression was used to assess dementia risk following exposure in early adult-life (<45 years) to low education, in midlife (45-65-years) to hearing loss, elevated LDL-cholesterol, depression, traumatic brain injury, physical inactivity, diabetes, smoking, hypertension, obesity, excessive alcohol use, and in late-life (≥65 years) to social isolation, air pollution, and vision loss. Midlife occupational physical activity, marital- and employment status were added to the Lancet model. The potential for dementia prevention was assessed using population attributable fraction (PAF).

Results: The total PAF for the 14 Lancet risk factors was 50.9% (95% confidence interval [CI] 37.7-61.4). Including sociodemographic factors, increased the PAF to 54.9% (95% CI 42.3-64.7, $p<0.0001$). In women the total PAF increased from 48.0% (95% CI 29.4-61.7) to 52.2% (95% CI 34.2-65.3, $p=0.009$) comparing the 14- to the 17-risk factors model. There was no significant difference in men ($p=0.71$).

Conclusions: Theoretically, addressing all 14 Lancet risk factors could prevent over half of all dementia cases. Adding aspects related to marital- and occupational status have additional risk reduction potential, both overall and in women.

P13

Health capacity to work among older adults in different occupational groups

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Introduction: As life expectancy rises and research shows improved health and function in old age, there is growing political interest in increasing labor force participation among older adults. Yet, it is unclear whether most people maintain the health and functional ability needed to work at older ages.

Aims: To examine how health capacity to work involving physical, mental, and cognitive health and functional capacity in older age varies across occupational groups.

Methods: We examined 55-69-year-olds who participated in the Trøndelag Health Study (HUNT4, 2017-2019). Health variables covered self-rated health, self-reported memory problems, chronic diseases, pain, functional status, BMI (measured), blood pressure and mental distress (HADS). The data was linked with current employment status and occupation in most recent job (ISCO-08) from Statistics Norway. First, the association between health and employment was assessed among 55-59-year-olds by occupational group and gender, using a linear probability model. Next, coefficients from this model predicted potential health capacity to work in age groups 60-64 and 65-69 years, assuming a uniform effect on employment by health across age. Inverse probability weighting by gender, age, education (three levels), and self-rated health (dichotomous) was used to correct for healthy selection.

Results: Among 12,736 participants aged 55-69 years included in the analysis, 49% were employed. In elementary occupations (ISCO 9, women), 51% of those aged 60-64 were employed with a predicted negative additional health capacity to work (-4 percentage points). At age 65-69, 15% were employed with a predicted 35 percentage points of additional health capacity to work. In manual occupations (ISCO 6-8, men), 74% of those aged 60-64 were employed with a predicted additional capacity of 1 percentage point. At age 65-69, 35% were employed with 31 percentage points of additional capacity. For managers and professionals (ISCO 1–2), a predicted health capacity to work of approximately 90% persisted in older age and both genders.

Conclusions: We found differences in potential health capacity to work across gender, age and occupational groups. Our findings suggest that many older adults, whether currently employed or not, possess untapped health capacity to work, provided they are matched with suitable job opportunities.

P14

Low and inequitable influenza and COVID-19 vaccination coverage among pregnant women in Norway: Nationwide population-based cohort study

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Introduction: Many countries recommend vaccination against influenza and COVID-19 during pregnancy, but surveillance of coverage is often lacking.

Aims: To estimate the coverage of influenza and COVID-19 vaccination during the second or third trimester of pregnancy in Norway and to investigate its associations with sociodemographic characteristics.

Methods: We combined nationwide individual-level registry data on childbirth, vaccinations and sociodemographic factors for all pregnancies in Norway between 1 September 2021 and 31 December 2022. We estimated maternal influenza and COVID-19 vaccination coverage and its correlates among women whose only indication for influenza vaccination was pregnancy, i.e., during the second and third trimester.

Results: Among 52,833 women eligible for influenza vaccination during pregnancy in the 2021/2022 influenza season, 27.7% (n=14,646) received the influenza vaccine. Similarly, among 50,108 women eligible for COVID-19 vaccination during pregnancy in the study period, 31.8% (n=15,951) received the COVID-19 vaccine. Coverage estimates were lower among mothers with immigrant background, low education, low income, low maternal age, multiple children, those living rurally and those outside the workforce. The lowest coverage was observed among immigrant women (14.5% for influenza, 16.0% for COVID-19 vaccination), with corresponding relative risks (RR) compared to native Norwegian women of 0.44 (95% CI: 0.42, 0.46) and 0.41 (95% CI: 0.39, 0.43). The highest coverage was observed among women with the highest education (38.2% for influenza, 43.6% for COVID-19), with corresponding RRs compared to women with the lowest education of 2.47 (95% CI: 2.33, 2.62) and 2.36 (95% CI: 2.24, 2.49).

Conclusions: The coverage of maternal vaccination against influenza and COVID-19 is insufficient. Additionally, there is high and consistent inequity in uptake. Timely and comprehensive surveillance of maternal vaccination programs should be prioritized to ensure that program performance can be adequately assessed and improved.