

OP46

NOVEL RISK FACTORS FOR MENORRHAGIA AND DYSMENORRHEA IN ADOLESCENCE USING THE ALSPAC COHORT

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Background Precise estimates of prevalence vary, but menstrual symptoms such as menorrhagia (heavy or prolonged bleeding) and dysmenorrhea (pain associated with period) are experienced by a large proportion of adolescent girls. Risk factors, co-morbidities and potential impacts of these menstrual problems on other areas of health and wellbeing are not well-characterised. We aimed to describe the prevalence of menorrhagia and dysmenorrhea in the Avon Longitudinal Study of Parents and Children (ALSPAC) cohort and to identify associations between these symptoms and other traits.

Methods Cases of both dysmenorrhea and menorrhagia were identified using self-report questionnaires administered nine times between the ages of 8 and 17 years ($n = 4,222$ responded to at least one). Cases were defined as respondents who had reported to have visited the doctor for the symptom, any time during puberty. We used the ALSPAC cohort's corresponding epigenetic data resource, ARIES, to identify differences in methylation between cases for each symptom and those who never had reported it (controls), to identify traits associated with each symptom. These identified traits were then explored in the full ALSPAC cohort, using logistic regression.

Results Of the 4,222 adolescents who had responded to at least one of the puberty questionnaires, almost 70% ($n = 2,915$) had experienced dysmenorrhea at least once during puberty and over 50% ($n = 2,123$) had experienced menorrhagia. Of these, 22% ($n = 641$) and 25% ($n = 527$) visited the doctor for dysmenorrhea and menorrhagia, respectively. These symptoms showed significant overlap with one another, but remained distinctive. The epigenetic findings revealed potential associations with novel traits, including inflammatory markers and child abuse. In ALSPAC, both symptoms were shown to be associated with increased C-reactive protein and higher average adverse childhood experience (ACE) score, among other traits including prenatal smoke exposure, higher average body mass index and lower socioeconomic position.

Discussion The prevalence of both dysmenorrhea and menorrhagia is high in ALSPAC, highlighting an important and neglected area for population health research and intervention. These findings may suggest that exposure to ACE may go on to increase likelihood of enduring more severe menstrual symptoms in adolescence, potentially mediated by higher BMI and circulating inflammatory proteins. The implication of ACE adds to the growing body of evidence that they negatively affect long-term health. This study overall describes novel associations between menstrual symptoms and early life exposures that warrant further investigation.

OP47

ENDOGENOUS HORMONES AND RISK OF INVASIVE BREAST CANCER IN PRE- AND POST-MENOPAUSAL WOMEN: FINDINGS FROM THE UK BIOBANK

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Background Circulating sex hormones and growth factors have been associated with the risk of invasive breast cancer, but the nature of these relationships is not fully understood. We used data from UK Biobank, a large study with hormone measures on the full cohort and repeat measures in a sub-sample, to estimate the magnitudes of the associations after allowing for measurement error.

Methods We included 30,565 pre-menopausal and 133,294 post-menopausal women in this analysis. Hormone concentrations were measured in serum collected between 2006 and 2010, and incident cancer cases were identified through linkage to national cancer and death registries. Multivariable Cox proportional hazards models were used, and hazard ratios (HRs) were corrected for regression dilution using repeat measures collected in about 5,000 women four years after recruitment (except for oestradiol).

Results During a median follow-up of 7.1 years, 527 pre-menopausal and 2,997 post-menopausal women were diagnosed with invasive breast cancer. Cancer risk was positively associated with testosterone in post-menopausal women (HR per 0.5 nmol/L increment: 1.18; 95% CI: 1.14, 1.23) but not in premenopausal women ($p_{\text{heterogeneity}}=0.03$), and with IGF-1 (insulin-like growth factor-1) (HR per 5 nmol/L increment: 1.18; 1.02, 1.35 (pre-menopausal) and 1.07; 1.01, 1.12 (post-menopausal); $p_{\text{heterogeneity}}=0.2$), and inversely associated with SHBG (sex hormone binding globulin) (HR per 30 nmol/L increment: 0.96; 0.79, 1.15 (pre-menopausal) and 0.89; 0.84, 0.94 (post-menopausal); $p_{\text{heterogeneity}}=0.4$). Oestradiol, assessed only in pre-menopausal women, was not associated with risk, but there were study limitations for this hormone.

Conclusion This study confirms associations of testosterone, IGF-1 and SHBG with breast cancer risk, with heterogeneity by menopausal status for testosterone.

OP48

IMPLEMENTATION OF HIP FRACTURE SERVICES: A QUALITATIVE STUDY USING EXTENDED NORMALIZATION PROCESS THEORY

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Background Hip fractures are a devastating injury with high healthcare costs. Despite national standards and guidelines, there is substantial variation in hospital delivery of hip fracture care and in patient outcomes. This study aimed to understand organisational processes that help or hinder the implementation of hip fracture services, using extended Normalization Process Theory (eNPT), which specifies four constructs that impact on successful implementation: capacity, potential, capability and contribution.

Methods Thirty semi-structured interviews were conducted with healthcare professionals involved in delivering hip fracture care at four hospitals across England. Staff were purposively sampled from across the care pathway, and comprised emergency department staff, orthogeriatricians, orthopaedic surgeons, physiotherapists and discharge coordinators. Data were analysed thematically and themes transposed onto constructs from eNPT.

Results The *capacity* of healthcare professionals to co-operate and co-ordinate their practice was achieved using formal mechanisms including shared information systems, multi-disciplinary team (MDT) meetings and integrated MDT documentation and protocols. Trauma coordinators organised important processes of care and facilitated MDT co-working. Transfer of patient information was compromised when these systems were not effectively implemented. Shared working spaces promoted frequent and spontaneous communication. Individual *potential* and commitment to operationalise services occurred through multiple processes. Training, mentoring and support for junior staff, particularly rotating doctors, helped their engagement in patient care. Shared commitment was undermined by complex dynamics between different professional groups, particularly medical and surgical staff. Clinical leads bridged these professional boundaries and promoted shared patient goals. *Capability* to deliver care was compromised by under-staffed and under-resourced services, including lack of geriatric and therapist input, particularly out-of-hours and at weekends, and lack of bed capacity. Staff identified strategies to mobilise existing resources including 'upskilling' of staff, effective prioritisation of patients and systems to track outlying patients on other wards. Bringing patients together on specialist wards enhanced workability by concentrating staff knowledge and expertise. Healthcare professionals made *contribution* by driving change and developing services through MDT meetings and consistent monitoring and auditing. Clinical leads were integral to service development by disseminating audit data, engendering enthusiasm and engaging staff from individual directorates. Ongoing development was shaped by executive support. Benchmarking services based on key performance indicators and linking clinical activity to funding mechanisms helped leverage executive support.

Conclusion Findings identify elements needed to implement hip fracture services successfully. Information will assist services in overcoming organisational barriers when implementing sustainable high-quality services to improve patient care.

Friday 17 September

Physical Activity, 09.00 – 11.30

OP49

IMPACTS OF THE PARIS CYCLING LANE EXPANSION PLAN ON CYCLING LEVELS: A NATURAL EXPERIMENTAL STUDY*

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Background Cities globally have started to seriously invest in more sustainable forms of transportation. Using routinely collected city-level data, we aimed to evaluate whether constructing new cycling infrastructure as part of the Paris Cycling

Lane Expansion Plan 2015–2020 affects cycling activity along new routes.

Methods Daily cycle count data from January 2018 to March 2020 were acquired for the city of Paris. Eight newly-built cycling infrastructure improvement projects were identified with pre-post data. Comparison streets were chosen if pre-intervention trends in cycling paralleled those at the intervention sites. Since data collection periods for each street were variable, several comparison streets were chosen for each site as follows: (A) one street for which monitoring data were available for the same one-year period as the intervention street, (B) one street that shared the same six-month pre- and post-monitoring periods as the intervention street. For streets without a full year of data ($n=3$), all available data were used. The average of all control streets for each method was calculated as an additional comparator. Difference-in-difference (DiD) analysis controlling for a public transportation strike during the study period was performed for all streets. In addition, for streets with at least one year of data, interrupted time series (ITS) analysis was conducted to corroborate DiD results.

Results There was some variation in effects between locations: significant net increases in cycling counts were observed in 4/8 streets (e.g. Boulevard Voltaire, Method A: 894 counts/day; 95% CI: 357, 1431). No significant effects were found for Rue Julia Bartet or streets assessed for only one month post-intervention (3/8). In general, DiD outcomes did not differ between methods for choosing control groups. However, comparisons with individually-matched control streets tended to have greater positive net effect sizes than those using the average of control streets, which were more likely to support the null hypothesis. In general, the ITS results corroborated DiD results in terms of direction of effect, but none of the ITS results besides the level and trend change for the strike were significant.

Discussion Infrastructural improvements were found to be effective for larger arterial streets and those with longer follow-up periods. The use of multiple control streets as well as ITS analysis lends weight to our findings. Further research should investigate why improvements were more effective at increasing cycling levels in certain streets than in others.

OP50

PUSH AND/OR PULL: A SYSTEMATIC REVIEW AND META-ANALYSIS OF STUDIES EVALUATING THE EFFECTIVENESS OF 'CARROT', 'STICK', AND COMBINED INTERVENTIONS ON MODIFYING TRAVEL BEHAVIOUR

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Background While active travel policies may positively affect health and the environment, evidence suggests small or inconsistent effects in these policies in changing travel behaviour. To identify which types of interventions are more effective, this systematic review and meta-analysis aims to (1) compare the effectiveness of positive ('carrot') strategies, negative ('stick') strategies, or a combination of the two on modifying travel behaviour and (2) assess which functions have greater impacts on travel outcomes.

Methods Nine databases were searched for controlled before-and-after studies of population-level interventions and travel