showed a similar propensity to do any active travel, but on average spent less time engaged in active travel. Findings were robust to different model specifications (e.g. using two-part models).

Conclusion Monitoring inequalities in PA requires assessing different aspects of the distribution within each domain.

P67   **USUAL PHYSICAL ACTIVITY AND SUBSEQUENT HOSPITAL USAGE OVER 20 YEARS IN A GENERAL POPULATION: THE EPIC-NORFOLK COHORT**

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Background UK government spending on health has risen on average by 3.7% per year since 1948, outpacing economic growth over the period, with approximately a half of this expenditure used for hospitals. While physical activity interventions have been reported to reduce hospital stays, it is not clear if usual physical activity patterns may be associated with subsequent hospital use independently of other lifestyle factors. We examined the relationship between reported usual physical activity, change in usual physical activity and subsequent admissions to hospital and time spent in hospital for 11 228 men and 13 786 women aged 40–79 years in the general population over two sequential 10-year follow-up period taking into account demographic and lifestyle factors.

Methods Participants from EPIC-Norfolk, a British prospective population-based cohort study were followed for 20 years (1999–2019) using record linkage to document hospital usage. Total physical activity was estimated by combining workplace and leisure time activity reported in a baseline lifestyle questionnaire and repeated with independent measures in a subset at a second time point approximately 12 years later.

Results Compared to those reporting no physical activity, participants who were the most active had a lower likelihood of spending more than 20 days in hospital odds ratio (OR) 0.75 (95% confidence interval (CI) 0.67–0.83) over the next 10 years after multivariable adjustment for age, sex, smoking status, education, social class and body mass index. Similar results were seen for 10-year follow-up after the second time point OR 0.60 (95% CI 0.50–0.72). Participants reporting any activity had a mean of 0.42 fewer hospital days per year between 1999 and 2009 compared to inactive participants, an estimated potential saving to the National Health Service (NHS) of £247 per person per year, or approximately 7% of UK health expenditure. Participants who remained physically active or became active 12 years later had lower risk of subsequent hospital usage than those who remained inactive or became inactive, p-trend < 0.001.

Conclusion Usual physical activity in this middle-aged and older population predicts lower future hospitalisations - time spent in hospital and number of admissions independently of behavioural and sociodemographic factors. Small feasible differences in usual physical activity in the general population may potentially have a substantial impact on hospital usage and costs.

P68   **ABSTRACT WITHDRAWN**

P69   **FAMILY-BASED PHYSICAL ACTIVITY PROMOTION: RESULTS FROM THE FAMILIES REPORTING EVERY STEP TO HEALTH (FRESH) PILOT RANDOMISED CONTROLLED TRIAL**

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Background Family physical activity (PA) promotion holds promise, but there is little high quality research evaluating its potential and impact. Following successful feasibility assessment and adaption, this pilot study assessed the acceptability of FRESH, a child-led family-based PA intervention delivered online, and explored preliminary effectiveness.

Methods In a three-armed pilot randomised controlled trial (prospectively registered: ISRCTN12789422), 41 families (with 7–11-year-old index child) were allocated to a standard care control (CON), 'pedometer' (PED), or 'family' (FAM) group of the Self-Determination Theory-guided FRESH intervention. All family members in PED and FAM received pedometers and generic walking information; FAM additionally received access to the FRESH website, enabling participants to select step challenges, log steps, and track progress as they virtually globetrotted. All family members were eligible to participate; follow-up occurred 8-weeks and 52-weeks post-baseline. During home visits, research assistants assessed physical (e.g., fitness), psychosocial (e.g., social support), and behavioural (e.g., device-measured family PA) measures. Process evaluation questionnaires assessed acceptability of the intervention and accompanying evaluation. Semi-structured focus groups were conducted and website engagement explored.

Results Of 41 families recruited (149 participants; 4.0±1.0 (mean±SD) people/family), 40 (98%) and 36 (88%) were retained at 8-week and 52-weeks follow-up, respectively. Compared to CON and PED, a greater percentage of FAM children self-reported doing more family PA (CON: 35%, PED: 45%, FAM: 83%) and found FRESH fun (CON: 93%, PED: 81%, FAM: 94%). Higher mean (±SD) scores were reported by parents in FAM for improved PA awareness (3.6±0.6 vs. 3.2±0.7) and increased family PA (3.0±0.8 vs. 2.5±0.8) compared to PED. Approximately 82% of FAM children wanted to keep using the FRESH website and 93% found it easy to use. Focus groups revealed FAM families enjoyed choosing weekly step challenges and were capable of identifying ways of meeting daily steps goals. In children, there were no notable between-group differences found for change in minutes in moderate-to-vigorous PA (MVPA) at 8 or 52 weeks. In contrast, change in MVPA minutes differed between adults in the FAM group and those in PED or CON groups (FAM vs CON: 9.4 [95%CI: 0.4, 18.4]; FAM vs PED: 15.3 [95%CI: 6.0, 24.5]; PED vs CON: -5.8 [95%CI: -15.1, 3.3]), however this was not maintained at 52-weeks.

Conclusion Preliminary process evaluation findings related to the FRESH intervention and evaluation were promising,

particularly amongst FAM participants. Preliminary effectiveness indicates potential changes in adults, but not in children, warranting further investigation.

P70 BODY SIZE AND COMPOSITION, PHYSICAL ACTIVITY AND SEDENTARY TIME IN RELATION TO ENDOGENOUS HORMONES IN PRE- AND POST-MENOPAUSAL WOMEN: FINDINGS FROM THE UK BIOBANK

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Background Anthropometric and lifestyle factors may influence cancer risks through hormonal changes but the evidence to date is not conclusive. We therefore investigated associations of body size and composition, physical activity and sedentary time with serum hormone concentrations in pre- and post-menopausal women.

Methods Design: Cross-sectional.

Setting: UK Biobank, a large prospective cohort study involving about 500,000 adults aged between 40–69 years when recruited in 22 assessment centres between 2006 and 2010.

Participants: 20,758 pre-menopausal and 71,101 post-menopausal women, of whom 4,803 (23%) and 15,469 (22%) respectively had accelerometer data.

Exposures: body mass index (BMI), height, waist to height ratio, waist to hip ratio, body fat mass, trunk fat mass, self-reported and accelerometer-measured physical activity and self-reported sedentary time.

Outcomes: serum concentrations of total and calculated free oestradiol, total and calculated free testosterone, sex hormone binding globulin (SHBG) and insulin-like growth factor-1 (IGF-1).

Statistical analysis: Multivariable linear regression analysis.

Results The exposure-outcome associations are reported only if there was at least a 5% difference in hormone concentrations between the highest and lowest exposure groups.

In pre-menopausal women, higher BMI was associated with a lower concentration of total oestradiol (15% difference in the highest vs. lowest BMI group, i.e., $35+$ kg/m^2 vs <22.5 kg/m^2) and a higher concentration of calculated free oestradiol (22%). The results for oestradiol were not available in post-menopausal women. In both pre- and post-menopausal women, higher BMI was associated with higher concentrations of total and calculated free testosterone (pre-menopausal 29% and 113%, post-menopausal 39% and 126%, respectively) and lower concentrations of SHBG and IGF-1 (pre-menopausal 51% and 14%, post-menopausal 51% and 12%, respectively). Similar associations were observed with other measures of body size and composition except height.

Self-reported physical activity was associated with somewhat lower concentrations of total and calculated free testosterone (pre-menopausal 10% (free testosterone), post-menopausal 5% and 11% respectively in the most vs. least active quartile) and a higher concentration of SHBG (premenopausal 11%, post-menopausal 10%), and the opposite was true for self-reported sedentary time. The associations were slightly stronger with accelerometer-measured physical activity, but were attenuated after adjustment for BMI.

P_{trend} for all reported associations was <0.0001.

Conclusion This study confirms strong associations between adult anthropometric factors and hormone and SHBG concentrations in both pre- and post-menopausal women; this may partly explain the effects of these factors on cancer risks. The associations with physical activity and sedentary time were at most modest.

P71 THE PROPENSITY TO CYCLE TOOL: A POLICY TOOL TO ESTIMATE CYCLING POTENTIAL FOR ENGLISH AND WELSH TRANSPORT PLANNERS

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Background Getting people cycling is an increasingly common objective in transport planning. A growing evidence base indicates that high quality infrastructure can boost cycling rates. Yet for measures to be effective, it is important to intervene in the right places. This creates the need for tools and methods to help answer the question 'where to build?'

The Propensity to Cycle Tool (PCT) www.pct.bike is an open source, freely available, interactive tool to help prioritise cycling in England and Wales, covering both commuting and travel to school. In addition to the tool the data are available as download to allow more detailed GIS analysis. It was created by an academic team for the Department for Transport.

Methods The PCT uses origin data from the 2011 Census on main mode of travel to work and the 2011 National School Census covering all state-schools in England. We modelled propensity to cycle as a function of route distance and hilliness between home and school or work. We generated scenarios, e.g. 'Go Dutch' – in which people in England were as likely to cycle as theDutch, accounting for trip distance and hilliness. We did this based on a synthetic microsimulation population, allowing flexible scenarios and more accurate impact calculations.

We estimated changes in the level of cycling, walking, and driving, and associated impacts on physical activity and carbon emissions. For adults we estimated health economic benefits from reductions in premature mortality and sickness absence from increases in physical activity. Health outcomes were calculated using a bespoke and improved version of the UK Transport Appraisal Guidance (originally based on the WHO HEAT tool). Our improvements include using individual level rather than aggregate data, ebikes, integrating health gains from cycling with losses from less walking, and adjusting physical activity levels for route hilliness.

Results The PCT scenarios show the substantial potential for increases in cycling and the large benefits that this could realise. For example in 2011, 1.8% of children cycled to school. Under the Go Dutch scenario, this would rise to 41.0%. This would increase physical activity from school travel among pupils by 57%, and reduce transport-related carbon emissions by 81 kilotonnes/year. These impacts would be substantially larger in secondary schools than primary schools (a 96% vs. 9% increase in physical activity, respectively).

Conclusion The PCT is currently used by over 60 local authorities in England and Wales, and is contributing to the development of local policies as part of the Cycling and Walking Investment Strategy.