association between risk of reporting mental illness in 2011 and employment trajectory of local authority of residence by 2011, (after controlling for individual risk factors and for neighbourhood deprivation in 2001, before the onset of the recession).

Conclusion Various personal, family and neighbourhood factors are associated with self-reported mental illness. Allowing for individual/family factors and local deprivation, people in local authorities where employment rates remained higher during the recession had lower risk of reporting mental illness, especially in the highlands and Islands of Scotland. Further research is being carried out to explore these relationships (eg controlling for migration and other possible area level determinants of mental health). The research underlines the importance of maintaining mental health services across Scotland during the recession to protect mental health and control inequality.

P7 THE IMPACT OF REGIONAL EMPLOYMENT LEVELS DURING THE GREAT RECESSION (2008 TO 2013) AND WORKLESSNESS ON THE HEALTH OF THE WORKING-AGE POPULATION: CROSS-NATIONAL ANALYSIS OF 16 EUROPEAN COUNTRIES

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Background Studies from single countries suggest that local labour market conditions, including rates of employment, tend to be associated with the health of the populations residing in those areas, even after adjustment for individual characteristics including employment status. The aim of this study is to strengthen the cross-national evidence base on the influence of regional employment levels and individual worklessness on health. Our objectives are to investigate whether higher regional employment levels are associated with better health over and above individual-level employment. This could be due to pathways such as weakening community cohesion, increasing place-based stigma and declining regional income.

Methods Individual-level data (n=20 485 aged 15 to 64 years) were taken from 16 countries in the European Social Survey (2014/15) and regional employment rates extracted from Eurostat. Health outcomes included self-reported heart or circulation problems, high blood pressure, self-rated health, depressive symptoms, obesity and allergies (as a falsification test). Our exposures of interest included worklessness, defined as individuals who did not report being in paid work. At the regional level we included the average employment rate of those aged 15 to 64 years from 2008 to 2013. We calculated multilevel Poisson regression models for the binary outcomes (calculating the incidence rate ratio (IRR)), which included individuals nested within NUTS regions and linear multilevel regression models for continuous measures, controlling for potential confounding variables.

Results Between 2008 and 2013 the employment rate declined the most in Spain and increased the most in Germany. Increased average regional employment rates were associated with better health outcomes: heart/circulation problems IRR=0.970 (95% CI 0.950 to 0.990); high blood pressure IRR=0.981 (95% CI 0.965 to 0.997); poor self-rated health IRR=0.974 (95% CI 0.956 to 0.992); obesity IRR=0.971 (95% CI 0.960 to 0.982); depressive symptoms b=0.992 (95% CI 0.987 to 0.997), allergies IRR=0.995 (0.977 to 1.013). Individual worklessness was associated with all health outcomes, most strongly with poor self-rated health. In models including both individual worklessness and the average regional employment rate, the latter remained associated only for obesity.

Discussion Lower regional employment levels and worklessness are associated with adverse health outcomes across European countries. When accounting for both individual- and regional-level employment variables, a separate association between the regional employment level was suggested for obesity. The key strength of our study was the use of comparable cross-national data that integrated individual- and regional-level variables, but is limited by the use of self-reported data. Further exploration of potential causal mechanisms is needed.

P8 INVESTIGATING EPIGENETIC DIFFERENCES IN RESPONSE TO SHIFT WORK: FINDINGS FROM *UNDERSTANDING SOCIETY* (UK LONGITUDINAL HOUSEHOLD SURVEY)

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Background Shift work is a feature of many occupations and has been associated with a range of adverse health outcomes, including obesity, diabetes, depression and cancer. The main proposed mechanism linking them is a disruption in circadian rhythms, particularly among night shift workers. DNA methylation may serve as a biomarker for circadian disruption and a potential mechanism by which shift work influences disease risk. In the context of a longitudinal study, we aimed to investigate whether shift work is associated with DNA methylation.

Methods Methylation profiling was performed using Illumina EPIC micro-arrays on whole-blood DNA samples, obtained from British Household Panel Survey (BHPS) participants of *Understanding Society* from 2010–2012. BHPS comprises a clustered random sample of households recruited in 1991, with all members followed annually. After pre-processing, 1175 samples and 857,071 CpG sites remained for investigation. Shift work variables were derived from 17 time points between 1991 and 2009: ever (n=359), current (n=88) and long-term (^{3} 3 years) shift work (n=154) (night and rotating). Epigenome-wide association analysis was performed using multivariable regression with adjustment for age, sex, batch and blood processing day. Further models were adjusted for cell-type composition and socio-economic variables. Methylation age was also estimated based on the Horvath epigenetic clock and the impact of shift work on 'epigenetic age acceleration' (EAA) was investigated.

Results In epigenome-wide association analysis, 50 CpG sites were associated with shift work with a nominal p-value$<1 \times 10^{-5}$ across the 9 main analyses, with the strongest signal of association at cg12880856 (*PPARG*) identified in relation to

ever working night shifts ($p=7.3 \times 10^{-8}$). There was nominal evidence for an inverse association between current shift and rotating work with accelerated ageing (EAA) (mean difference=-0.98 (-1.93, -0.39); p=0.041 and −1.11 (−2.19,–0.04); p=0.041, respectively).

Conclusion Shift work was associated with differential methylation in blood, including a CpG site in *PPARG*. This CpG site is specific to the Illumina EPIC array, not being present on the predecessor 450 K array, and represents a potentially novel finding. PPAR-gamma has been implicated in the pathology of obesity, diabetes and cancer, although further work is required to appraise the causal effect of methylation on health outcomes. Furthermore, there was some evidence that current shift workers had decelerated methylation age compared with non-shift workers. However, the number of shift workers in this study was relatively small and further validation of findings is required.

P9 DOES CHILDHOOD SOCIO-ECONOMIC DISADVANTAGE MODERATE HEALTH BEHAVIOURS AND OCCUPATIONAL AND ENVIRONMENTAL HAZARDS ASSOCIATION'S WITH ADULT LUNG FUNCTION; A CROSS SECTIONAL ANALYSIS USING THE UK HOUSEHOLD LONGITUDINAL STUDY

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Background Lung function is lower in people with disadvantaged socio-economic position (SEP) and is associated with certain health behaviours and exposures. The effects are likely to be interactive, for example socially patterned environmental tobacco smoke (ETS) in childhood is associated with an increased effect of smoking in adulthood. We hypothesise that disadvantaged childhood SEP increases susceptibility to the effect of hazards for lung function in adulthood. We test whether disadvantaged childhood SEP moderates smoking, physical activity, obesity, occupational exposures, ETS and air pollution's associations with lung function.

Methods Data are from the Nurse Health Assessment (NHA) in waves two and three of United Kingdom Household Longitudinal Study (UKHLS). The NHA is drawn from the UKHLS General Population Sample, a stratified, clustered, equal probability sample, and from the British Household Panel Survey sample which began in 1991 as a stratified random sample. Analysis is restricted to English residents aged at least 20 for women and 25 for men; an analytical sample of 16 328. Lung function is measured with forced expiratory volume in the first second (FEV_1) and standardised to the percentage of expected FEV_1 for a healthy non-smoker of equivalent age, gender, height and ethnicity (FEV_1%). A multilevel approach was used with individuals nested in households in neighbourhoods. Using STATA14, a mixed linear model was fitted with interaction terms between childhood SEP and health behaviours and occupational exposures. Cross level interactions tested whether childhood SEP moderated household ETS and neighbourhood air pollution's associations with FEV_1%.

Results SEP, smoking, physical activity, obesity, occupational exposures and air pollution were associated with lung function. Interaction terms indicated a stronger association between disadvantaged childhood SEP and currently smoking (coefficient (_b) −6.506%, 95% confidence intervals (95% CI): −9.561%, −3.451%), formerly smoking (_b −2.331% 95% CI −3.674%, −0.988%) and occupational exposures, (_b −1.436% 95% CI −2.725%, −0.147%). Significant interactions were not found with physical activity, obesity, ETS and air pollution.

Conclusion The findings suggest that disadvantaged SEP in childhood may make people more susceptible to the negative effect of smoking and occupational exposures in adulthood. This is important as those most likely to encounter these exposures are at greater risk to their effects. Policy to alleviate this inequality requires intervention in health behaviours and via health and safety legislation.

P10 LONG TERM HEALTH EFFECTS OF NEET EXPERIENCES: EVIDENCE FROM SCOTLAND

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Background Reducing the number of young people not in employment, education or training (NEET) is high in political agenda in many countries. The Europe 2020 flagship initiative Youth on the Move introduce a number of programmes that tackle this problem. Although NEET young people have been identified as one of the most vulnerable groups since the 1990s, little is known about the long-term effect of NEET experiences, especially the health consequences. This paper investigates whether experiences of NEET young people are associated with poor health.

Methods We used the Scottish Longitudinal Study (SLS), which collates information from the 1991, 2001, and 2011 censuses as well as from vital events, for a 5.3% representative sample of the Scottish population. Linked health data such as hospital admissions and prescribing in general practice are also available. We followed around 14 000 young people who were aged 16–19 in 1991 up to 2010. We explored whether NEET young people in 1991 displayed higher risks of poor physical and mental health in the follow-up period. Three health outcomes are used in the analysis: mortality, hospitalisation and prescription of anti-depressant and anti-anxiety medication. We used logistic regression to model the probability of hospitalisation and poor mental health. We fitted a Cox proportional hazards model to model time to death. Covariates include a number of individual socioeconomic characteristics and local area characteristics.

Results Over 40% of the cohort members have been admitted into hospital, while over 15% have been prescribed with anti-depressant and anti-anxiety drugs, and 1% died in the follow-up period. The NEET status in 1991 appears to be associated with hospitalisation with adjusted odds ratio (OR) of 1.24 (95% Confidence Intervals (CIs): 1.08–1.42). Also the NEET experiences are associated with poor mental health with OR of 1.47 (95% CI 1.27 to 1.71). The hazard ratio of death for NEETs is more than twice that for non-