

blood pressure (systolic BP:  $-0.78$ ; 95% CI:  $[-1.26, -0.31]$  kg; diastolic BP:  $-0.46$ ; 95% CI:  $[-0.87, -0.04]$ ) at 13.5 years. Similar results were obtained for skinfold-derived AR. Many of the above associations were fully explained by fat mass at 13.5 years. However, the association between skinfold-derived AR and SBP was still significant after adjusting for fat mass ( $-0.37$ ; 95% CI:  $[-0.72, -0.01]$ ).

**Conclusion** BMI and skinfolds produced similar estimates of age at adiposity rebound. Associations of AR with BMI and cardio-metabolic risk factors at 13.5 years were comparable regardless of how we derived AR. AR appears to be related to later cardio-metabolic risk markers through its association with fat mass. Skinfolds, as a more direct measure of adiposity than BMI, may be a better method for estimating AR when available.

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#### AN ECONOMIC EVALUATION OF A COMPLEX WORKPLACE DIETARY INTERVENTION: A CLUSTER CONTROLLED TRIAL

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**Background** The workplace is recognised as a priority environment to influence dietary behaviours and improve employee healthy. Yet, previous workplace dietary interventions have failed to combine clinical effectiveness evidence with economic costs, thus the cost-effectiveness of workplace dietary interventions remains unknown. Employing cost and outcome data from the Food Choice at Work (FCW) study, a cluster controlled trial of complex workplace dietary interventions, this study employed an economic evaluation of nutrition education, environmental dietary modification and combined workplace interventions.

**Methods** A 9 month time horizon was assumed (length of interventions). Each of the dietary interventions (education, environment and combined) were compared to a control workplace. Firstly, a cost-benefit analysis (CBA) employed the monetary value of absenteeism to report the net benefit of the interventions compared to the control, from an employer's perspective. Secondly, cost-effectiveness analyses (CEAs) were performed using intervention-specific clinical measures (body mass index (BMI), weight and midway waist circumference) to measure health outcomes. Thirdly, a cost-utility analysis (CUA) measured the cost-effectiveness of the interventions in terms of quality adjusted life years (QALYs). The robustness of the QALYs were assessed as the results of the CEAs and CUA were compared. Probabilistic sensitivity analysis (Monte Carlo simulation) assessed parameter uncertainty.

**Results** The environment intervention reported the highest net benefit (€ 146/employee) which was associated with an average reduction of 0.7 absent days. The environment intervention also reported the lowest incremental cost-effectiveness ratios (ICERs) for BMI (€ 14/kg/m<sup>2</sup>), waist circumference (€ 3/cm) and weight (€ 7/kg). The CUA demonstrated similar results as the environment intervention also reported the lowest ICER of € 98/QALY, followed by the education (€ 971/QALY) and combined interventions (€ 2,156/QALY). The cost-effectiveness acceptability curve (CEAC) indicated that the environment intervention had a 50% probability of being cost-effective when compared to the control at a ceiling ratio

of € 45,000/QALY. However, as demonstrated on the CEAC, no decision uncertainty surrounded the cost-effectiveness of the education or combined interventions, the control had a higher probability of being cost-effective.

**Conclusion** Although demonstrated over a short timeframe, environmental dietary modification alone, offers a potentially cost-effective approach for improving employee health and generating positive net benefit for employers. While environmental dietary modification strategies are potentially sustainable and important interventions for obesity prevention, future research should include long-term outcomes to determine if improvements in outcomes persist.

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#### THE PREVALENCE AND DETERMINANTS OF POLYPHARMACY: DATA FROM THE BRITISH 1946 BIRTH COHORT

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**Background** Polypharmacy, a growing phenomenon within the British population, has been linked with increased falls, reduced functional status and higher all-cause mortality in later life. However the risk profile for individual medications is not universal, with cardiovascular medications in particular posing a high risk. Prior research has found that greater socio-economic disadvantage is associated with higher levels of polypharmacy but studies rarely control for disease burden or distinguish between cardiological and non-cardiological polypharmacy. The aim of this study was to describe the development of polypharmacy and its composition in a British birth cohort in its seventh decade and to investigate socioeconomic and gender differences independent of disease burden.

**Methods** Medication data from the Medical Research Council National Survey for Health and Development (NSHD), the oldest British birth cohort, were analysed to determine the prevalence and composition of polypharmacy at age 69 and its change from ages 60–64. Multinomial regression was used to test associations between gender, education and occupational social class and total, cardiological and non-cardiological polypharmacy controlling for the number of diagnosed diseases.

**Results** At age 69, 22.8% of individuals were taking more than 5 medications. There was an increase in the use of 5 to 8 medications (+2.3%) and over 9 medications (+0.8%) between ages 60 to 64 and 69. The greatest increases were found for cardiovascular (+13.4%) and gastrointestinal medications (+7.3%). Men experienced greater cardiological polypharmacy, women greater non-cardiological polypharmacy. Higher levels of education were associated with lower levels of both types of polypharmacy independent of disease burden, with strongest effects seen for over five cardiological medications (RRR 0.3, 95% CI 0.2, 0.5  $p < 0.001$  for advanced secondary qualifications compared with no qualifications); there was no additional effect of occupational class.

**Conclusion** Polypharmacy, particularly cardiological polypharmacy, increased over the seventh decade and was associated with lower educational attainment. While this study could not assess the appropriateness of the polypharmacy observed, it provided understanding of its genesis and the possible benefits of targeted interventions to reduce potential harm caused by

adverse drug events. Further study of the consequences of different types of polypharmacy should take into account these educational differences.

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#### LIFE COURSE SOCIOECONOMIC POSITION EFFECTS ON INFLAMMATION IN OLDER ADULTS: COMPENSATING FOR MISSING DATA IN THE ENGLISH LONGITUDINAL STUDY OF AGEING

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**Background** Greater cumulative life-course exposure to socioeconomic disadvantage is associated with higher levels of inflammatory biomarkers, C-Reactive protein and fibrinogen which are associated with increased cardiovascular disease risk. However, in most existing studies, researchers often use complete case data for analyses and ignore the impact of missing data on inference for blood based biomarker data. The English Longitudinal Study of Ageing (ELSA) has considerable missing data but the impact of missingness on inference is seldom examined.

This paper aims primarily to examine whether the levels of adulthood inflammatory biomarkers of C-Reactive protein and fibrinogen can be explained by life course socioeconomic position. We evaluate the typologies of missing data under Missing Completely at Random and Missing at Random mechanisms and methods for compensating for missing data under these mechanisms.

**Methods** This paper uses cross-sectional data from Wave 2 of ELSA (2004) which includes 9432 men and women aged over 52 living in England. However, only 6000 people had data for C-Reactive protein and fibrinogen. Logistic Regression modelling is implemented to identify predictors of missingness in ELSA health examination and blood collection. We use multiple linear regression modelling for analysing the association between socioeconomic position and C-Reactive protein and fibrinogen after accounting for different mechanisms of non-response using the following methods: complete case analysis (listwise deletion), inverse probability weighting and multiple imputations.

**Results** Participants who refused to respond to the health examination were more likely to be renters, White, single, living in London or with poor assessed health. Those who refused to give a blood sample were more likely to be older female, living East of England or London, had cancer/cardiovascular disease/stroke and poorer self-assessed health. Complete case analysis showed that people with lower education level [0.14(CI0.04–0.25)] and working in lower supervisory position [0.17(CI0.04–0.30)] were more likely to have higher C-Reactive protein levels. While people in the highest wealth quintile were less likely to have higher C-Reactive protein [−0.26(CI−0.36,−0.14)] and fibrinogen levels [−0.02(CI−0.04,−0.004)]. These associations remained similar in inverse probability weighting and multiple imputations although there was some variation in the estimates from the different methods for compensating for missing data.

**Conclusion** While associations between socioeconomic position and inflammatory markers were similar across different

approaches for compensating for missing data, there were differences in the estimated coefficients suggesting that it is important to account for missing biomarker data for statistical inference.

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#### EARLY LIFE FACTORS ASSOCIATED WITH LIFE COURSE TRAJECTORIES OF RESTING HEART RATE

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**Background** Elevated Resting Heart Rate (RHR) is an established cardiovascular risk factor and higher RHR even in childhood has been associated with higher adult mortality rates. We are the first to describe trajectories of age-related changes in RHR in the same individuals followed from childhood to later life. We hypothesised that indicators of better health, development and socioeconomic advantage in early childhood would be reflected in lower RHR trajectories, independent of smoking status.

**Methods** Data were from the Medical Research Council National Survey of Health and Development (maximum n=4779) followed from birth in 1946. RHR was measured on eight occasions between 6–69 years (three in childhood and five in adulthood). Information on early life factors was ascertained prospectively. Multilevel models were used to estimate life course mean RHR trajectory by sex, and to investigate associations with childhood socioeconomic position (SEP), birth weight (BW), growth from 2–6 years (conditional change in Body Mass Index (BMI) and height), duration of breast feeding (BF), and markers of neurodevelopment (age at first walking independently and cognitive ability at eight years).

**Results** Mean estimated RHR decreased with increasing age and plateaued from early adulthood tending to remain higher in women. In sex-adjusted analyses higher BW and conditional BMI change were associated with lower RHR at 6 years and across the life course (−0.57bpm (95% confidence interval: −0.95;−0.18) per 1 kg higher BW and −0.23bpm (−0.42;−0.05) per 1kg/m<sup>2</sup> greater change in BMI); however neither influenced the rate of change with age in RHR. Neither SEP nor BF duration was associated with childhood RHR but associations with RHR trajectory emerged in adulthood such that by 60 years RHR was 1.28bpm (0.10;2.16) higher in participants from a disadvantaged versus advantaged SEP and −1.13bpm (−2.01;−0.24) lower for BF>=8 months versus never. A later age at walking independently was associated with a higher RHR at 6 years (1.33bpm (0.22;2.44) for>=18 months versus <12 months) but lower RHR in adulthood (−1.09bpm (−2.48;0.30) at 60 years). Childhood cognitive ability was not associated with RHR. In a model including all early life factors, estimates were typically only slightly attenuated from sex-adjusted models except that adjustment for conditional growth substantially reduced the effect of BW. Associations were independent of life course smoking status.

**Conclusion** Early life is a key period in determining future RHR trajectories with effects of potentially modifiable factors persisting into the seventh decade of life.