Hierarchical models for international comparisons: a case study of smoking, disability and social inequality in 21 European countries

**Background** International comparisons of social inequalities in health are challenging. The level of disaggregation often required can result in sparse data. We show the value of a hierarchical Bayesian approach that partially pools country-level estimates, reducing the influence of sampling variation and increasing the stability of estimates. A further challenge is how to simultaneously present the level of inequality and their precision on relative and absolute scales. We illustrate a new way of displaying estimates of prevalence, relative and absolute inequalities for men and women with and without disabilities in 21 European countries. Smoking prevalence estimates are generated from a hierarchical Bayesian model, where we assume country-specific

**Methods** BI policies were assessed using the Sheffield Alcohol Policy Model. Previous analysis has shown a national BI programme for alcohol to be both cost-effective and inequality-improving. We examined whether these conclusions changed under three scenarios: i) individually excluding socioeconomic gradients in each model input, ii) raising levels of uptake to those in the ‘best’ group, iii) using different baseline populations. Impacts on total population health and health inequality were assessed using incremental population Net Health Benefit (NHB) and incremental ‘Equally Distributed Equivalent’ (EDE) health respectively. Results are compared with those from similar analyses undertaken using a smoking cessation model.

**Results** A national BI programme improved both health (+43,016 QALYs) and EDE (+50792 QALYs), reducing health inequalities. Excluding gradients in model inputs had generally small effects on NHB (0% to +10.4%) but a larger effect on EDE (-7.9% to +15.7%), although not enough to change the conclusion that the policy is inequality-reducing. Increasing delivery to the ‘best’ level would increase EDE to a greater extent than NHB (+51.6% and +43.5% respectively), further reducing inequalities.

**Conclusion** Unlike smoking cessation programmes, BIs are likely to be both cost-effective and reduce inequalities. Considering potential inequalities across all stages of intervention delivery is important when considering the impact of policies on health inequalities, even if it may not substantially affect decisions based solely on cost-effectiveness. The relative importance of socioeconomic gradients in different stages is likely to vary between risk factors and settings.

**Hierarchical Models for International Comparisons: A Case Study of Smoking, Disability and Social Inequality in 21 European Countries**

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10.1136/jech-2019-SSMabstracts.63

**Background** Education is a strong predictor of voting in most Western countries. New studies, predominantly from the United States, question the role of health as a mechanism reinforcing social inequalities in voting over the life-course. In the United Kingdom, we previously found that heavy smoking, physical inactivity, poor self-reported health, and, to a lesser extent, drinking over the recommended limit were each associated with a lower probability of voting in the 1958 National Child Development Study (NCDS). Building on these findings, this study examines the proportion of the association between educational attainment and voting that is mediated through these health indicators.

**Methods** We used the data of 6,166 NCDS participants who responded to each sweep between the ages of 23 and 50. We examined educational attainment at the age of 23, smoking, drinking, physical activity, self-reported health at the ages of 23, 32, and 42, and voting behaviour at the age of 42, 46, and 50. Adjusting for non-response and attrition using inverse-probability weights results in a bias-adjusted estimate of the proportion of the association that is mediated through health.

**Conclusion** Smoking and physical activity had the largest health mediation effects, with 57% of the association between educational attainment and voting being mediated through smoking. For women, these mediated effects were larger than those for men. Further mediation was found for employment and physical activity. Smoking and physical activity were the main drivers of the mediation effects, suggesting that reducing smoking and physical activity may reduce the social gradient in voting.
probability weights and missingness using multiple imputation, we compared prevalence ratios to examine: 1) the direct effect of having a higher level of education on voting when accounting for these health indicators, and 2) the proportion of its total effect that is eliminated by this adjustment.

**Results** Contrasting extreme groups, we found that participants with a degree (NVQ5/6) at the age of 23 were 25%, 28%, and 32% more likely to have voted in the last general election compared to those with no qualifications at the ages of 42, 46, and 50. Adjusting for health indicators at the ages of 23, 32, and 42, participants with a degree remained 19%, 24%, and 27% more likely to have voted at the ages of 42, 46, and 50, respectively. This translates into an average proportion eliminated of 22%, 18%, and 16% across these age points. Testing mediators separately, we found that smoking, physical activity, and self-reported health were each likely to contribute to the ‘education-voting’ association.

**Discussion** In keeping with health promotion principles, health represents beyond the absence of disease a resource for individuals, their social network, and their communities. Our findings suggest that health and its behavioral determinants are likely to explain a portion of social inequalities in voting over the life-course. Research and intervention should address the specific health-related mechanisms through which current electoral processes may unequally influence voter turnout across social groups.

**OP64** THE IMPACT OF POLITICAL ECONOMY ON POPULATION HEALTH: A SYSTEMATIC REVIEW OF REVIEWS

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10.1136/jech-2019-SSMabstracts.65

**Background** Although there are many studies considering specific aspects of political economy and health, there have been few attempts to synthesise the literature. This work describes a systematic review of reviews of the literature describing the impact of political economy on population health.

**Methods** We searched Medline, Embase, International Bibliography of the Social Sciences (IBSS), Proquest Public Health, Sociological Abstracts, Applied Social Sciences Index and Abstracts (ASSIA), EconLit, SocIndex, Web of Science and the grey literature via ‘Google Scholar’; for reviews of the literature. Relevant exposures were differences or changes in: policy, law or rules; economic conditions; institutions or social structures; politics, power or conflict. Relevant outcomes were mortality, life expectancy, survival, morbidity, well-being, illness, ill-health and lifespan. All citations were reviewed independently by two authors for relevance. Critical appraisal of all included reviews was undertaken using modified AMSTAR criteria and then synthesised narratively giving greater weight to the higher quality reviews.

**Results** From 4,912 citations, 58 reviews were included. Both the quality of the reviews and the underlying studies within the reviews were variable. Social democratic welfare states, higher public spending, fair trade policies, extensions to compulsory education provision, microfinance initiatives in low income countries, health and safety policy, improved access to healthcare, and high quality affordable housing have positive impacts on population health. Neoliberal restructuring seems to be associated with increased health inequalities and higher income inequality with lower self-rated health and higher mortality. There are evidence gaps on the relationship between governance, polities, power, macroeconomic policy, public policy and population health, including the social class processes and forms of discrimination which generate inequalities. For some areas, such as the relationship between income inequality and mean population mortality, there is a need for a high quality systematic review. Primary research gaps also existing, for example on the impact of housing policy, availability and tenure.

**Conclusion** Politics, economics and public policy are important determinants of population health. Countries with social democratic regimes, higher public spending and lower income inequalities have populations with better health. There are substantial gaps in the synthesised evidence on the relationship between political economy and health and there is a need for higher quality reviews and empirical studies in this area. However, there is sufficient evidence in this review, if applied through policy and practice, to have marked beneficial health impacts.

**Obesity & Physical Activity**

**OP65** THE EFFECTS OF PEDOMETER AND OTHER STEP-COUNT MONITORING INTERVENTIONS ON PHYSICAL ACTIVITY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMISED CONTROLLED TRIALS

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10.1136/jech-2019-SSMabstracts.66

**Background** Physical inactivity is a growing public health concern, and the fourth leading cause of death globally. Pedometers measure step-counts and can increase physical activity levels. Newer devices, for example mobile phone applications and body worn devices, also measure step-counts and require scrutiny of their effectiveness. Our primary aim is to conduct a systematic review and meta-analysis of the effects of pedometer and other step-count monitoring interventions on physical activity levels among the adult general population.

**Methods** We systematically searched seven databases using MeSH headings and keywords to identify randomized controlled trials published after 1/1/2000. We included trials with healthy adults participants aged ≥18, or those at risk of disease. Children, those selected with a specific health condition, high-performance trainers and hospital-based studies were excluded. The intervention group comprised community-based step-count monitoring interventions including pedometers with objective physical activity measures; the comparator group incorporated ‘usual standard care’ or healthcare advice with minimal active engagement. The primary outcome was change in step-count at follow-up compared to baseline. A random-effects model was utilized to assess the primary outcome, and a risk of bias assessment determined the quality of included studies. The protocol is registered PROSPERO: CRD42017075810.

**Results** Following initial database searching of 14,356 records and subsequent forward citation search, 54 studies were included, of which 13 were part of the narrative synthesis. 41 studies were therefore incorporated in the quantitative meta-analysis; 22 providing estimated mean between-group