

P13 SYNTHETIC CONTROL METHODOLOGY AS A TOOL FOR EVALUATING PUBLIC HEALTH INTERVENTIONS – A LITERATURE REVIEW

¹J Bouttell*, ¹J Lewsey, ²F Popham, ²P Craig, ³M Robinson. ¹Health Economics and Health Technology Assessment, University of Glasgow, Glasgow, UK; ²MRC/CSO Social and Public Health Sciences Unit, University of Glasgow, Glasgow, UK; ³Public Health Science Directorate, NHS Health Scotland, Glasgow, UK

10.1136/jech-2018-SSMabstracts.139

Background The synthetic control method (SCM) improves causal inference in non-randomised studies by building a counterfactual using a weighted combination of potential control units. Although it has been widely used in other disciplines it is not widely used in public health research. Our objectives were to identify the use of SCM studies in health and to summarise strengths and limitations identified in the literature. **Methods** We included studies that used a SCM design to investigate a health outcome of any intervention in any population. We searched for the term ‘synthetic control method’ in 26 health, social science and grey literature databases as well as checking for additional studies by key authors. No restrictions were placed on language or date. Searches were completed in February 2016. We summarised key information about the studies including setting, number of treated and control units, intervention and outcome, number of pre- and post-intervention data-points available and other methods used in the same study.

Results Searches identified 35 health-related studies of which 23 were from US settings and investigated a single treated unit. Most studies had at least 10 control units. Interventions investigated included health finance and health systems reform, industry regulation and taxation policies. Common outcomes were mortality rates and insurance rates/health care access. Most studies had more than 4 pre- and post-implementation data-points. SCM is most commonly used alongside difference-in-difference methods. Advantages of SCM are that it does not rely on parallel pre-implementation trends and that it allows for time-varying unmeasured confounders. Limitations include the need for suitable data on both the treated unit and a pool of potential controls, difficulties if the treated unit is an outlier and the inapplicability of traditional statistical tests due to the small number of treated and control units and the fact that they have not been randomly allocated. Falsification tests are generally used as an alternative.

Conclusion This comprehensive literature review suggests that SCM has been little used in health despite some advantages over existing methods. Future research incorporating the method, ideally in combination with other methods, would be of value.

P14 A CRITICAL COMPARISON OF STATISTICAL AND INDIVIDUAL-BASED SIMULATION METHODS IN OBESITY RESEARCH

^{1,2}KF Arnold*, ^{1,2}MS Gilthorpe, ^{1,2}WJ Harrison, ^{1,3}AJ Heppenstall. ¹Leeds Institute for Data Analytics, University of Leeds, Leeds, UK; ²School of Medicine, University of Leeds, Leeds, UK; ³School of Geography, University of Leeds, Leeds, UK

10.1136/jech-2018-SSMabstracts.140

Background It is widely acknowledged that the obesity epidemic exhibits many characteristics of a complex system – individual heterogeneity and autonomy, interdependence,

adaptivity, feedback loops, threshold effects, and emergence. Altering patterns of obesity requires robust methods that are capable of accurately estimating the causal effects of potential interventions in the presence of such complexity. Two groups of methods that have been proposed are of interest: (1) statistical regression models informed by directed acyclic graphs (DAGs), underpinned by graphical model theory; and (2) individual-based simulation models (IBSMs), consisting of microsimulation models (MSMs) and agent-based models (ABMs). Both groups of Methods may be used to evaluate causal effects as counterfactual contrasts, but methodological work seeking to compare and contrast the two methods is lacking, because they have only come to prominence relatively recently and have been largely confined to separate research disciplines. We sought to examine how these methods have been used within obesity research, identify the primary philosophical and methodological differences between them, and identify any implications for future causal analyses.

Methods We conducted searches of Medline, EMBASE, and Scopus to identify articles (from 1996–2016) that sought to make causal inferences relating to obesity, weight, or other closely associated health-related behaviours (e.g. exercise) by utilising either DAG-based statistical methods or IBSMs.

Results Our search returned 38 relevant articles utilising DAG-based statistical methods and 45 relevant articles utilising IBSMs (31 MSMs and 14 ABMs). From these results, we identified four primary differences between the two groups of Methods: (1) their relative reliance on theory versus data; (2) the timescales upon which they operate; (3) their relative focus on fixed versus random effects; and (4) the ways in which they assess the effects of (hypothetical) interventions.

Conclusion The results of our search cast light on how the two groups of methods might be used as complementary strategies, as well as the circumstances under which their causal Conclusions might diverge. DAG-based analyses, whilst mathematically robust, are not well-suited to scenarios in which data do not exist or are hard to measure, where the exposures/interventions of interest ‘spillover’ amongst individuals, and random effects are of specific interest. IBSMs, in contrast, are flexible enough to handle such complexity, though the robustness of their causal conclusions is in contention. Greater integration of the methods should be sought, as it has the potential to aid causal inferences in complex systems; to this end, further methodological work is needed.

P15 LATENT CLASS REGRESSION MODELLING: A NOVEL APPROACH TO PREDICT SURVIVAL IN PATIENTS WITH CHRONIC HEART FAILURE (CHF)

^{1,2,3}JL Mbotwa*, ⁴M de Kamps, ^{1,2}PD Baxter, ²R Cubbon, ^{1,2}MS Gilthorpe. ¹Leeds Institute for Data Analytics, University of Leeds, Leeds, UK; ²School of Medicine, University of Leeds, Leeds, UK; ³Department of Applied Department, Malawi University of Science and Technology, Malawi; ⁴Institute of Artificial and Biological Intelligence, School of Computing, University of Leeds, Leeds, UK

10.1136/jech-2018-SSMabstracts.141

Background Chronic Heart Failure (CHF) is one of the leading cause of hospitalizations and deaths, more especially in old people, and this causes a substantial clinical and economic burden to the government. Using risk prediction models to accurately understand the dynamics of survival patterns amongst patients with CHF conditions would provide guidance to health care professionals in decision making on how

to improve delivery of care. However, prediction models used in medical research often fail to accurately predict health outcomes due to methodological limitations. These models particularly perform poorly when predicting narrowly targeted subgroups of patients. We explore the role of latent class regression (LCR) analysis to model the survival of patients with CHF. We seek to show that using LCR improves the modelling of health outcomes as it accounts for unobserved heterogeneity that exists naturally within the patient data.

Methods LCR generally involves identifying hidden latent classes within data and uses patient's demographic characteristics and other covariates to predict class membership and separate regression models for each class. These latent classes may correspond to subgroups of patients with specific characteristics that affect their survival. The rationale is that one class will be more susceptible to deaths compared to another. The United Kingdom Heart Failure Evaluation and Assessment of Risk Trial (UK-HEART) recruited patients with signs and symptoms of CHF between July 2006 and December 2014. A total of 1802 records were available on patient characteristics as well as medications. We used some of these variables to model survival of patients within a latent class framework by estimating a single regression model for both latent classes. We increased complexity of our model by allowing each class to have a separate survival model.

Results We used the area under the receiver operating characteristic (ROC) curve to assess the performance of these two class models. Overall, our novel approach performed better than the traditional one-model-fits-all approach. Our model gave an area under the curve (AUC) of 0.87 while the traditional model yielded an AUC of 0.68.

Conclusion Ignoring the natural heterogeneity that exists within the patient data affects the accuracy of estimates in prediction models. Researchers can utilise the available data to identify hidden latent classes within the data. Fitting a regression model to each latent class improves the accuracy of the prediction estimates.

P16 STIGMATIZATION OF SMOKERS: THE ROLE OF SCHOOL TOBACCO POLICIES

PO Robert*, A Grard, N Mèlard, V Lorant. *Institute of Health and Society (IRSS), UCL, Bruxelles, Belgium*

10.1136/jech-2018-SSMabstracts.142

Background Stigma exists when components of labeling, stereotyping, separation, and discrimination occur together in a power situation. This may apply to smoking, a behavior being increasingly denormalized. However, it is unknown whether School Tobacco Policies (STP) may lead to the stigmatization of adolescent smokers. Our aims are (1) to measure the magnitude of each stigmatization's components and (2) to assess how STPs influence them.

Methods Data on 11 493 adolescents in 43 schools in 7 European countries were used (SILNE R-survey, 2016). Dependent variable was Stuber's scale to measure stigmatization with four items: *most people think less of person who smoke, believe that smoking is for losers, most non-smokers would be reluctant to date someone who smokes and would not hire a smoker to babysit children*. Independent variables were: being a weekly smoker, having friends smoking, parental smoking and the score of school tobacco policies (STPs).

We performed multilevel regressions which include interactions between weekly smoking and other independent variables.

Results The most frequent stigmatization components were related to discrimination such as 'not to hire a smoker as a babysitter' (77%) and not 'dating a smoker' (55%). Smokers always reported less stigmatization compared to non-smokers. Differences between smokers and non-smokers were more pronounced for 'not to hire a smoker as a babysitter' (62% vs 80%, $X^2=182$, $p<0,001$) and less so for stereotype: '*most people think less of person who smokes*' (Smokers: 45%; non-smokers: 52%, $X^2=15$, $p<0,001$). Multilevel regression showed that stigmatization was lower in smokers, increased with none of my friends being smokers, decreased with parental smoking. In addition, smokers felt more stigmatized in schools with higher STPs score.

Conclusion Smoking is associated with a loss of status. STPs increase stigmatization within school while social environment (friends and family) decrease stigmatization. This suggest that social ties may reduce the effect of stigmatization on smoking behavior among adolescents.

P17 ORGANISATIONAL STAKEHOLDERS WHO ENGAGE IN SCOTTISH E-CIGARETTE POLICY DEBATES: A MIXED METHODS APPROACH

¹S Hilton*, ¹T Ikegwuonu, ²K Smith, ³H Weishaar. ¹MRC/CSO Social and Public Health Sciences Unit, University of Glasgow, Glasgow, UK; ²Social Policy, School of Social and Political Sciences, University of Edinburgh, Edinburgh, UK; ³Public Health, Hertie School of Governance, Berlin, Germany

10.1136/jech-2018-SSMabstracts.143

Background Electronic cigarettes (e-cigarettes) have become subject to highly contested public and political debates, including the role of commercial stakeholders in development and implementation of e-cigarette policy. There are concerns that e-cigarette debates provide opportunities for commercial stakeholders to demonstrate alignment with public health interests, build reputation, and gain influence over policy processes. While previous research on commercial sector engagement in policymaking has enhanced understanding of its impact on public health, a striking research gap exists regarding commercial actors' engagement in e-cigarette debates.

Setting Taking the Scottish context as a case study, this project aims to increase understanding of commercial stakeholders' engagement in policy debates on e-cigarettes, generate debate on the sector's engagement in e-cigarette policy, and contribute to the development of effective e-cigarette policy. The project is investigating commercial stakeholders' interests in, and positions on, the benefits, harms and regulation of e-cigarettes, the ways in which interests and positions are presented and evidence is framed, and efforts to build collaboration and shape e-cigarette policy.

Methods A mixed-method approach has been applied, combining the use of social network analysis to systematically analyse the relationships between commercial and other policy stakeholders and thematic analysis of documentary and interview data to explore the nature of commercial stakeholders' engagement in policy debates on e-cigarettes in Scotland. Publicly available policy documents and data from semi-structured, in-depth interviews with key stakeholders have been analysed.

Results The analysis focuses on stakeholders' interests in, and positions on, the benefits and harms of e-cigarettes, the ways