study has suggested that PT may be able to make a useful contribution to improving public health policy evaluations.

OP114 ASSOCIATION OF DRUG PRESCRIPTIONS WITH INCIDENT DEMENTIA

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10.1136/jech-2019-SSMabstracts.113

Background Recent studies have reported conflicting associations between drug prescriptions and incident dementia. Any association between drug and dementia could be due to the drugs directly causing or preventing dementia; the drugs being associated with a risk factor for dementia; or the drugs being prescribed as a consequence of prodromal dementia. Based on methodology developed for genome-wide association studies, we systematically analyzed the effect of 733 drugs on incident dementia in a population-wide linkage study and clinically reviewed the associations.

Methods Using linked, routinely-collected electronic health records from hospital admissions, mortality records and primary care consultations, we followed-up 574,237 Welsh residents from their 60th birthday onwards to classify exposure (drug prescriptions) and dementia incidence. During follow-up, 13,786 (2.4%) of the study population developed dementia. We used time-dependent Cox proportional hazard models to study the effect of exposure on dementia incidence, controlling for the effects of age, sex, year, deprivation and smoking status. To account for multiple testing, we first analyzed a 50% household-area stratified random sample of the study population (discovery cohort), selected results with a Bonferroni-corrected *p*-value, re-run the analysis of 'significantly' associated drugs in the remaining 50% (validation cohort) and once again selected results with a Bonferroni-corrected *p*-value. We displayed the results (hazard ratio and *p*-value) from the complete cohort in several stratified volcano-plots and clinically reviewed the findings to identify potential pathways of effect.

Results 177/733 (24%) of the analysed drugs were significantly associated with dementia incidence. Of those, 7 were for neurodegenerative conditions that can cause dementia, 14 were for vascular diseases, 13 for diabetes, 16 for depression and 39 for symptoms or complications of dementia. Only four, all travel-related vaccines, were associated with a lower dementia incidence. Some drugs associated with an increased hazard of dementia clustered around several unexpected indications, including: gastro-oesophageal reflux disease, altered bowel habit, lower urinary tract symptoms and infections, anxiety, sleep disturbance, pain and nausea/vertigo.

Discussion By grouping drugs by indication, we identified several drugs with a potential of having a direct association with increased risk of dementia. We also identified drugs which are related to (known) risk factors for dementia, including those prescribed for cardiovascular disease and diabetes. The effect of travel-related vaccines is puzzling and might be more related to a preventative association of travelling with dementia incidence. Most interestingly, we identified several drugs which might have been prescribed as a consequence of a pre-clinical, non-cognitive syndrome in dementia.

OP115 IMPROVING THE ASSESSMENT OF CAUSALITY IN POPULATION HEALTH: SHOULD BRADFORD HILL BE REVISITED TO INCORPORATE DEVELOPMENTS IN CAUSAL INFERENCE?

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10.1136/jech-2019-SSMabstracts.114

Background Bradford Hill's (BH) guidelines are the traditional approach to causal assessment in population health and epidemiology. However, assessments can be inconclusive; there is no consensus on the thresholds required for components. Some have proposed incorporating more recent developments in causal thinking to BH guidelines to improve assessment of causality. This study aims to understand how traditional approaches to causal assessment can be refined by incorporating alternative causal methods. We will do this by understanding the similarities and differences of these approaches to BH.

Methods We mapped each BH component against three subsequent, prominent causal inference approaches: directed acyclic graphs (DAGs), grading of recommendations, assessment, development and evaluation methodology (GRADE), and sufficient-component cause models (SCC, also referred to as 'causal pies'), drawing upon existing studies that had assessed the overlap between one or more of these approaches. Existing studies were found through targeted searching and snowballing, with no a priori list of inclusion/exclusion criteria.

Results The approaches can be grouped into two categories: models (DAGs and SCC) and assessment guidelines (BH and GRADE). The literature does not necessarily explicitly make this distinction, but the identified literature largely restricted comparisons within each of these categories.

We found that some components overlap between the guidelines and models, while some are specific to certain approaches. For example, BH causal assessment considers if an increased exposure corresponds with increased incidence of the disease (dose-response). Similarly, GRADE will upgrade evidence from an observational study with evidence of dose-response. However, testing dose-response for DAGs may not be helpful. A dose-response may be demonstrated for different exposure levels due to a confounder that has the same impact on the exposure and the outcome. Thus, it would be the confounder causing the dose-response, not the causal relationship. The SCC model is often drawn with binary exposures and outcomes where dose-response is not considered. However, it can be incorporated by including dose as providing different contributions to the causal pie. Similar comparisons were made for the remaining BH components.

Conclusion Assessing causal relationships is challenging, yet of fundamental importance. There have been limited efforts to incorporate insights from DAGs and SCC into BH guidelines. However, our review did not investigate all potential approaches to assessing causality (e.g. International Agency for Research on Cancer) and the comparisons require further analysis. Nevertheless, this detailed exploration improves the

potential for refining our approach to making judgements about causal relationships in public health.

OP116 ASSOCIATION OF EPILEPSY WITH DEMENTIA: A RETROSPECTIVE NATIONWIDE DATA LINKAGE COHORT STUDY

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10.1136/jech-2019-SSMabstracts.115

Background People with epilepsy (PWE) are reported to have higher risk of dementia. However, the magnitude of this association, whether it varies according to dementia subtypes and whether there are factors that modify the association is uncertain. We investigated the apparent association in a large population-based retrospective cohort study using routinely-collected linked health data from hospitalisation, mortality records and primary care consultations.

Methods We used linked health data from the Secure Anonymised Information Linkage (SAIL) databank to follow-up Welsh residents for whom linked primary care data were available from their 60th birthday to estimate dementia rate and associated risk factors. Disease (dementia), exposure (epilepsy) and covariates (medication, smoking, stroke and diabetes) were classified using previously validated code lists. We studied rate of dementia and dementia subtypes in people with and without epilepsy using (stratified) Kaplan-Meier plots and flexible parametric proportional hazard analyses.

The study population comprised 563,808 people of whom 19,807 (4%) had indications of epilepsy in the linked health data. 13,454 (68%) of PWE and 49,439 (9%) of people without epilepsy had at least one record for a prescription of an antiepileptic drug (AED). Compared to people without epilepsy, PWE had lower survival (median survival to age 79 years compared to 84), higher smoking risks (74% compared to 66%) and higher stroke risks (20% compared to 7%) before or during follow-up.

Results Between ages 60 and 70 years, 6% of PWE and 1% of people without epilepsy had a diagnosis of dementia; corresponding figures between ages 60 and 80 years were 23% and 8%. The difference in dementia rate between those with and without epilepsy was larger for vascular dementia than for Alzheimer's disease. The increased rate for PWE was modified by a history of stroke, smoking and, to a lesser effect, diabetes. PWE who were first diagnosed before age 25 years had a lower dementia rate than those diagnosed later in life. Compared to PWE not exposed, those exposed to sodium valproate were at higher risk of dementia (crude HR: 1.7; 95% CI: 1.5–1.9) while those exposed to a group of enzyme-inducing AED were at similar risk (crude HR: 1.1, 95% CI: 1.0–1.3).

Conclusion At least some of the increased risk of dementia in PWE can be attributed to increased vascular risk factors in PWE causing vascular dementia. Given the widespread use of sodium valproate in PWE, the association of the drug with higher dementia risk is concerning.

Rapid Fire Programme
Friday 6 September
Chronic Disease

RF01 EDUCATIONAL OUTCOMES AMONG CHILDREN WITH TYPE 1 DIABETES: WHOLE-OF-POPULATION STUDY

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10.1136/jech-2019-SSMabstracts.116

Background Evidence about the impact of type 1 diabetes (T1D) on educational outcomes is mixed. Despite advances in clinical care and intensive insulin treatment regimens, achieving optimum metabolic control is a challenge in pediatric populations with T1D. Poor metabolic control leading to hyperglycemia or hypoglycemia can potentially have implications for children's educational outcomes. In the last decade, there has been substantial improvement in T1D management, therefore the objective of this study was to estimate to what extent T1D is linked to children's educational outcomes.

Methods This whole-of-population study (n=61,445) used de-identified, administrative linked data from the South Australian Early Childhood Data Project (births 1999–2013). This study examined the impact of T1D on reading, writing, spelling, grammar and numeracy scores of children in year 5 (age 10 years), assessed by the National Assessment Program-Literacy and Numeracy (NAPLAN) in 2008–2015. Children with T1D were identified from hospitalization data (2001–2014) using ICD-10-AM diagnosis codes (E10, E101-E109).

The effect of T1D on the five NAPLAN domains (continuous variables) was estimated by augmented inverse probability treatment weighting (AIPW). AIPW includes; 1) creation of weights and, 2) using those weights in the outcome regression in a way such that the final estimates of the treatment effect is unbiased, even if the weights regression or the outcome regression is incorrect. We explored two associations between T1D and educational outcomes; 1) T1D versus non-T1D, 2) time since diagnosis (≤2 years, 3–10 years) versus non-T1D. Additionally, to address the problem of missing data we used multiple imputation.

Results Among 61,445 children born in South Australia and who had undertaken NAPLAN assessments, 162 had been diagnosed with T1D. There was no difference in the mean reading, writing, spelling, and grammar and numeracy scores of children with and without T1D. For example, the crude mean reading score was 482.8 with a standard deviation of 78.9, and the average treatment effect was 6.84 (95% CI -6.25, 19.92), which reflects a negligible difference in the mean reading scores of children with and without T1D. There was also no difference in educational outcome between children who were recently diagnosed (exposed to T1D for ≤2years), or those who were exposed to T1D for 3–10 years at the time of NAPLAN assessment, compared with non-T1D.

Conclusion This whole-of-population study demonstrated that children with T1D are not performing poorly on literacy or