between LLTI and mortality when no such influence is present in the simulated data. A DAG aids comprehension of this issue from a causal inference perspective and, depending upon the exact nature of the MC present, the DAG can also point to alternative analytical strategies that are discussed.

Conclusion Mathematical coupling of ratio variables has been recognised and reported on in the past, yet its problems remain pervasive. By setting the problem within a causal framework, we provide a means by which the issue might be more readily identified. Furthermore, using DAGs can help direct alternative analytical strategies to remove bias due to MC from future health research.

P83 EXPLAINING THE FALL IN CORONARY MORTALITY IN ARGENTINA BETWEEN 1995 AND 2010: IMPACT MODELLING ANALYSIS

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Background Coronary heart disease (CHD) mortality has declined substantially in Argentina in the last decades. However, the contributory factors remain unclear because major CHD risk factor levels have paradoxically increased, notably physical inactivity, obesity and diabetes.

our objectiv is to quantify the contributions of prevention and treatment to the coronary heart disease mortality trends in Argentina between 1995 and 2010.

Methods We used the previously validated IMPACT model to analyse mortality trends between 1995 and 2010 in the Argentinean population aged 25 years and over. This model integrates data on changes in population size, CHD mortality, risk factors, and uptake of evidence-based cardiac treatments. Main data sources included official vital statistics, national health surveys, and published papers in the scientific literature. If none of these were available, we used expert judgement. Relative risks and regression coefficients came from the published meta-analyses. The difference between observed and expected CHD deaths in 2010 was then partitioned among treatment benefits and risk factor changes. We also performed probabilistic sensitivity analyses to quantify the potential effects of parameter uncertainty.

Results From 1995 to 2010, age-adjusted CHD mortality rates in Argentina fell by 24.1%, resulting in 8500 fewer CHD deaths in 2010 had mortality rates remained unchanged. Improvements in medical and surgical treatments were associated with 53.8% *(95% uncertainty interval, 46.2%–61.8%)* of the total mortality decrease. Major contributions came from heart failure therapies (15.1%), antihypertensive medication (11.9%), and secondary prevention following acute myocardial infraction (8.2%).

Risk factor changes accounted for 40.4% *(9.5% to 65.6%)* of the mortality fall. Decreases in systolic blood pressure accounted for 34.6%; in cholesterol levels, 19.9%; and in smoking prevalence, 6.7%. However, rises in diabetes, BMI and physical inactivity negated some of these benefits, potentially **increasing** mortality by 9.4%, 6.4% and 5.0%, respectively. Approximately, 6% of the deaths prevented or postponed could not be explained in our model.

Results Approximately 54% of the CHD mortality fall in Argentina between 1995 and 2010 was attributable to increases in evidence-based medical treatments, and 40% to falls in population risk factors. However, the substantial contributions from falls in blood pressure, cholesterol and smoking were offset by adverse trends in diabetes, obesity and physical inactivity. Our results highlight the potential for further improvements in cardiovascular

P84 DEFINING A PRIMARY COMPOSITE OUTCOME FROM HOSPITAL EPISODE STATISTICS DATA TO TEST THE BENEFIT OF CARDIAC MAGNETIC RESONANCE (CMR) IMAGING AFTER PRIMARY PERCUTANEOUS CORONARY INTERVENTION (PPCI)

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Background We researched the feasibility of using routinely collected data to establish a registry to document the use of cardiac magnetic resonance imaging (CMR) in patients with suspected heart attack who activate the primary percutaneous coronary intervention (PPCI) pathway. To compare outcomes between patients having CMR or not, we aimed to define a primary composite outcome, representing clinically important changes in management resulting from CMR, using data from Hospital Episode Statistics (HES) or the Patient Episode Database Wales (PEDW). Clinically important changes in management, and patient subgroups to which these related, were defined by formal consensus.

Methods Patients at four UK sites were prospectively consented. We assembled a database by linking hospital-collected data about the index PPCI admission (demography, clinical, biochemistry and imaging) and CMR 'exposure' within 10 weeks with HES/PEDW data for the following 12 months. An experienced medical coder identified ICD10 diagnostic codes and OPCS procedure codes that the pre-defined clinically important changes in management achieved by CMR were hypothesised to influence. Episodes in HES/PEDW inpatient, outpatient and accident and emergency datasets with these codes were identified. This process was applied to key patient subgroups: i) PPCI; ii) multivessel coronary disease; iii) out-of-hospital cardiac arrest; iv) coronary angiogram showing unobstructed arteries.

Results Of the 1670 patients consented, 1476 (88%) had PPCI; 682 (41%) had multivessel disease, and 194 (12%) had unobstructed arteries. 189 (11%) had CMR within 10 weeks of the index admission. 1612 (97%) had their index event identified in HES/PEDW and 985 of these (61%) had a full year of follow-up available. Focusing on important changes by patient subgroup avoids creating a composite outcome based on diverse changes. Frequencies of relevant health episodes will be reported for patient subgroups and by CMR exposure. Comparing frequencies is straightforward but identifying better targeting of care to patients' needs without a change in frequency, e.g. due to better diagnostic accuracy of CMR, is complex.

Discussion Clinical events relating to important changes in management resulting from CMR can be identified in HES but CMR may not alter the frequency of these events. This case study demonstrates the promise of using routinely

collected data to evaluate changes in practice. However, it is challenging to identify subtle changes in management such as better targeting of care without changing its frequency. In future, imaging investigations and changes in management should be identified more accurately by linking to the Diagnostic Imaging Dataset and prescribed medications.

P85 EXCLUSION OF COMMUNITY-LED INITIATIVES BY PUBLICATION BIAS: EVIDENCE FROM A SYSTEMATIC SCOPING REVIEW OF COMMUNITY ENGAGEMENT IN THE UK

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Background A recent systematic review found that initiatives with high levels of community engagement may produce more positive health outcomes than those with lower engagement. Systematic reviews in this area risk publication bias because (i) literature on community based health initiatives is widely dispersed and poorly indexed; and (ii) professionally-led (top down) interventions are more likely than community-led (bottom up) interventions to be formally evaluated and published.

An opportunity to examine the gap between research and practice arose in a systematic scoping review commissioned by the UK National Institute of Health and Care Excellence (NICE), of current practice in community engagement.

Methods We searched specialised research registers and websites; literature searches and citations from recent relevant systematic reviews; and direct calls for evidence via networks of community practitioners and groups. Records were screened independently by more than one reviewer, and included if published after 2000, relevant to the UK and evaluated or described community engagement in public health. Included records were coded for type, level and extent of community engagement, indicators of disadvantage, issues and outcomes.

Results 316 articles were included, 72% were research or evaluation studies (7% were randomised controlled trials; most were mixed methods or qualitative studies). 26% were found through website searches and the calls for evidence. The issues addressed most frequently were social capital or social cohesion (41%) and community wellbeing (35%). Indicators of health inequality observed most frequently were socioeconomic (39%) and "other" (39%), including people with disabilities; refugees and asylum seekers; mental health service users. Only 33 initiatives reported a high extent of community engagement; a comparatively high proportion were in the non-research literature (20% of non-research articles, compared to 8% of research articles). This may indicate a gap between organisations which usually write and publish research articles, and organisations which fully involve community members, and/or may indicate challenges in the evaluation or publication process of high community engagement initiatives.

Conclusion Using conventional systematic review methods to examine community based approaches risks overlooking community-led "bottom up" initiatives, which may have the highest potential to reduce health inequalities. Reviewers should therefore make every effort to find reports of such initiatives, and consider broadening their definition of "evidence".

P86 ARE PROCESS EVALUATION MEASURES RELATED TO INTERVENTION OUTCOMES IN THE PACE-UP PRIMARY CARE PEDOMETER-BASED WALKING TRIAL?

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Background PACE-UP trial results demonstrated positive effects of a pedometer-based walking intervention on objective physical activity (PA) outcomes at 3 and 12 months in 45–75 year old primary care patients, in both postal and nurse-supported trial arms compared to controls. We explored associations between intervention implementation measures and change in PA outcomes.

Methods In accordance with the MRC guidance and framework (2014), the methods were selected through a key function model. Three quantitative aspects of the process evaluation relating directly to PA outcomes at 12 months were identified to assess intervention implementation: nurse session attendance (dose); PA diary completion (fidelity); and pedometer use (fidelity). These were considered as independent variables in the multi-level models estimating the effectiveness of the intervention on PA outcomes (changes in step-counts and time in moderate-to-vigorous PA (MVPA) levels in $\geq$10 min bouts).

Results Dose participants attending all 3 nurse sessions increased their step-count at 3 months by 961 steps more than those attending 0–2 sessions (95% CI 401–1520, p=0.001). Minutes of MVPA were also significantly increased by 64 (36, 92) at 3 months and by 28 (1, 54) at 12 months. Fidelity: both postal and nurse groups showed strong positive associations of diary return on step-count and minutes of MVPA at 3 months compared with those who didn't return the diary: postal steps 1458 (854, 20161), nurse steps 873 (190, 1555), postal MVPA 64 (33, 94), nurse MVPA 47 (17, 75). These differences had decreased by 12 months, and only the postal group effects remained statistically significant: steps 1114 (538, 1689), MVPA 47 (17, 75). Regular pedometer use in the postal group was associated with higher step counts at 3 and 12 months: 1029 (383, 1675) and 606 (22, 1990) respectively. Regular pedometer use was not associated with PA outcomes in the nurse group.

Discussion Process evaluation measures showed significant associations with most PA outcomes at 3 and 12 months. These were stronger for the postal than the nurse group for diary and pedometer use. We cannot infer causality from these results, but the strong associations between nurse appointments, diary return, pedometer use and PA outcomes suggests that they were important factors in enabling the trial changes observed. We have shown the MRC framework to be an effective tool for process evaluation of intervention implementation.