

Conclusion This review contributes to new understandings of health-related community resilience and its measurement. Using rapid review methods limited the scope of the search, and the focus was mainly on European literature. While there is learning from community disaster resilience methods, transferability to population health needs to be tested. Based on review gaps, recommendations are made for future research topics.

Methodological Issues

OP112

USE OF OUTCOME 'CHANGE-SCORES' IN OBSERVATIONAL DATA ARE A POTENTIAL SOURCE OF INFERRENTIAL BIAS

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Background Studies of change are a cornerstone of research in the health sciences. Robust analyses of change are however extremely challenging, especially in observational data.

In simple exposure-outcome scenarios, one common approach is to create and analyse an outcome 'change-score' by subtracting the baseline outcome from follow-up outcome. Tens-of-thousands of articles can be found that have adopted this approach. Unfortunately, this approach fails to capture the (desired) modifiable component of the outcome variable that occurred after baseline. On the contrary, it retains sign-reversed information from the baseline outcome that can create extremely-misleading associations.

Using directed acyclic graphs (DAGs) and illustrative simulations, this study explains why outcome change-scores do not capture the true causal quantity of interest and demonstrates the extent of disagreement between robust analyses and change-score analyses in various circumstances.

Methods DAGs with deterministic nodes are used to explain why change-scores do not capture the (desired) modifiable component of the outcome that occurs after baseline. The implications are then illustrated in simulated data, by analysing outcome change-scores with respect to a baseline exposure under several causal scenarios.

Data were simulated using DAGitty R 0.2–2 to match three broad scenarios, with the baseline outcome as 1) competing exposure, 2) confounder, and 3) mediator for the total causal effect of the exposure on the follow-up outcome. Means, standard deviations, and distributions were informed by data from the US National Health and Nutrition Examination Survey for 2009–2014. The association between the baseline exposure and outcome change-score was estimated by linear regression; and the coefficients compared to the known truth and coefficients obtained from robust analyses.

Results Naïve regression analyses of the outcome change-score (insulin) with respect to the baseline exposure (waist circumference) produced biased causal inferences in all scenarios except where the exposure and outcome were uncorrelated at baseline (as in a randomised experiment). When the baseline outcome (insulin) confounded the effect of the baseline exposure (waist circumference) on the follow-up outcome, the

naïve regression estimate remained confounded. When the baseline outcome (insulin) mediated the effect of the baseline exposure (waist circumference) on the follow-up outcome, the naïve regression estimate had the opposite sign to the total causal effect.

Conclusion Analyses of change-scores should be avoided in observational health research, as they can produce extremely misleading coefficients. Previous observational studies that have naively analysed and interpreted change-score variables should be viewed with extreme caution and any recommendations revisited.

OP113

SEEKING CAUSAL EXPLANATIONS IN POLICY EVALUATION: AN ASSESSMENT OF APPLYING PROCESS TRACING TO THE BARBADOS SUGAR-SWEETENED BEVERAGE TAX EVALUATION

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Background Finding an association between a policy and an effect in an observational study is not enough to prove a causal relationship. Impact evaluations may be strengthened by developing an understanding of the causal explanation(s) behind an association. Here, we assess the feasibility of using process tracing (PT). While PT has been applied to a limited number of programme evaluations, we believe this is the first attempt to apply the method to a public health policy evaluation. Given evidence of a statistical association, can PT be usefully operationalized in a public health policy evaluation?

Methods We used the Barbados sugar-sweetened beverage (SSB) tax as a case study. We previously demonstrated an association between tax introduction and an observed decrease in SSB sales. According to dominant theory, price change is the sole mechanism through which SSB taxes dampen consumer demand. However, SSB taxes may also have a signaling effect, raising awareness and reducing demand. Following PT best-practice, we developed causal theories, pre-specified the evidence we would expect to find under each theory, operationalized tests to identify this evidence, and assessed the probative value of each test. We assessed prior confidence in both theories and described implications of each test.

Results We identified a range of potential tests (8 tests of the price change only theory, 8 separate tests of the signaling effect). For example, one test of the signaling effect could be an assessment of whether the public's perception of 'good' vs. 'bad' drinks matches the pattern of change observed more than a categorization based on taxed vs. untaxed status. In this example, we propose to use print media to qualitatively identify how 'good' and 'bad' drinks were characterized (i.e. were sodas and juices portrayed differently?) and then use this categorization to re-analyze grocery store sales data using an interrupted time series. If this categorization explains the data more fully than an analysis based on taxed/untaxed status, this test would strongly favor signaling over the price change only hypothesis, making this a test with high probative value. We identified methods and data that could be used to empirically assess each test and assessed each test's probative value.

Conclusion Further work will be needed to empirically conduct and critically assess as many of these tests as possible, prioritizing those with greatest probative value. However, this