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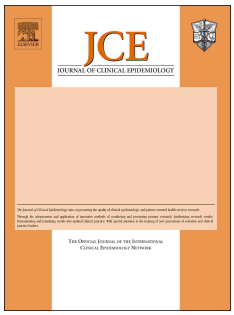

Identifying quasi-experimental (QE) studies to inform systematic reviews Dec 20 2014

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Identifying quasi-experimental studies to inform systematic reviews

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Abstract: Objective
This paper reviews the available evidence and guidance on methods to identify reports of quasi-experimental (QE) studies to inform systematic reviews of health care, public health, international development, education, crime and justice, and social welfare.

Study Design and Setting
Research, guidance and examples of search strategies were identified by searching a range of databases, key guidance documents, selected reviews, conference proceedings and personal communication. Current practice and research evidence were summarised.

Results

4914 records were retrieved by database searches and additional documents were obtained by other searches. QE studies are challenging to identify efficiently because they have no standardized nomenclature and may be indexed in various ways. Reliable search filters are not available. There is a lack of specific resources devoted to collecting QE studies and little evidence on where best to search.

Conclusion

Searches to identify QE studies should search a range of resources and, until indexing improves, use strategies that focus on the topic rather than the study design. Better definitions, better indexing in databases, prospective registers and reporting guidance are required to improve the retrieval of QE studies and to promote SRs of what works based on the evidence from such studies.

***Manuscript (with PAGE numbers)**

Identifying quasi-experimental (QE) studies to inform systematic reviews

Dec 20 2014

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Abstract

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What is new?

- Searches to identify QE studies should search a range of resources and, until indexing improves, use strategies that focus on the topic rather than the study design.
- Better definitions of QEs and better indexing of QE studies in databases is required to improve efficient retrieval.
- Policymakers, stakeholders and researchers need to encourage prospective registration of reviews of QE studies in resources such as PROSPERO and need to create a repository of quasi-experimental studies that address health systems and can be used to identify studies to include in SRs.

- *Keywords*: Quasi-experimental studies; databases; information retrieval; systematic reviews
- *Running title*: **Identifying quasi-experimental (QE) studies**
- 196 words (a word count)

INTRODUCTION

Searching for studies for consideration in systematic reviews (SRs) involves using search terms combined into conceptual groups to identify potentially eligible studies in relevant resources (e.g. bibliographic databases). Several variant definitions of the term 'quasi-experimental studies' (QE studies) have been proposed across disciplines and over time (see Becker et al. in this journal issue for a concise discussion). Here, we follow Rockers et al. (this journal issue) in placing QE studies in a broad taxonomy of study designs, alongside experiments and non-experiments, where QE studies aim to make causal inferences about the effects of an exposure or intervention of interest (referred to here as the 'treatment') on outcomes by exploiting exogenous variation in treatment assignment (1-4). In QE studies, unlike experiments, the assignment of treatment is not under the control of the researcher. Exogenous variation refers to variation in the assignment of treatment that is determined outside the system of causal relationships under study (5). Exogenous variation is a desirable characteristic of treatment assignment in studies aiming to make causal inferences because this allows both observed and unobserved confounding to be controlled in the statistical analysis, which reduces risk of bias in their estimates of treatment effects.

In SRs of interventions or exposures whose effects are not, for practical or ethical reasons, amenable to measurement using experimental study designs, QE studies may form a substantive component of the available evidence base for effects. Even when experimental designs are possible, the results of QE studies may form a substantive component of the evidence base for effects (6). Other articles in this series set out the case for authors to consider designing systematic reviews of interventions and exposures to incorporate evidence for effects collected from QE studies; propose a set of criteria that authors could usefully apply to inform

this decision, including whether critical assumptions have been met in studies; and discuss aspects of the methods and institutional set-up for successful evidence synthesis including quasi-experimental results (7-12). One challenge for achieving SRs of QE studies is the identification of the QE studies to be reviewed. This paper reviews the available evidence and guidance on how best to search for QE studies and suggests topics for research.

METHODS

What are we seeking to identify?

This paper reviews search methods to identify QE studies in the following fields: health systems research; international development; public health; education; crime and justice; and social welfare. In general, a search strategy used to populate a systematic review (SR) is defined by the topic of interest (for example, the impact of school vouchers on educational attainment or of a 'fat tax' on rates of obesity). Such searches may be restricted to reports of specific study designs, perhaps to retrieve studies that use a QE design. In this paper we focus on the challenges of searching for QE studies *per se*. In line with the approach described in Reeves et al in this issue (13), our exploration is partly whether a search focusing on methods and study design characteristics associated with QE studies is a reliable way to identify those studies.

The key to study design in QE studies is an identification strategy (explaining the assumptions made to identify causal effects) that seeks exogenous variation in the treatment which is independent of all other factors, observed or unobserved, that influence the outcomes of interest. This is achieved by various techniques including regression discontinuity and instrumental variables. In experimental studies this variation is provided by randomisation. In

non-experimental designs identification strategies may rely on drawing on a rich enough set of observed confounders to justify an assumption of conditional independence, so that treated and controls are comparable in all relevant respects other than their exposure to treatment. For the purposes of identifying QE studies it is important to know that some QE studies are observational and some are not.

Searches

We conducted searches (details in Table 1) to identify evidence on search methods for QE studies, formal guidance, examples of current practice and personal experience. We sought information on the development of search strategies, combinations of concepts, the use of search filters, the availability of indexing terms for QE studies, the range of information resources to be searched and the availability of specific resources collecting QE studies.

We developed several search strategies to find information retrieval research (Figure 1). These drew search terms from the conceptual framework and definitions that are typically used in QE studies. These are combined with terms that relate to the range of methods used to analyse QE studies, including instrumental variables, regression discontinuity designs, selection and control function approaches, and difference studies including fixed effects in panel data.

From the search results, we selected studies and examples that reported on the identification of QE studies and reviewed and summarized their content.

RESULTS

Results of the database searches

4924 records were retrieved by database and website searches and were assessed for relevance. There was little information of direct relevance to searching for QE studies. 20 documents provided information for this study:

- MacLehose et al. reported a SR comparing the effect sizes derived from randomized and non-randomized studies (14). The authors noted that electronic searches to retrieve non-randomized studies were very difficult to design and yielded few papers.
- Harris et al (15) explored the use and interpretation of QE studies in medical informatics in 2006. They provided a typology of QE studies, but no information on how to search for them or the search strategy that they had used themselves.
- Three search filters (reported in six publications) to identify non-randomized studies (16-21) were identified.
- Two documents reported the methods for Cochrane Effective Practice and Organisation of Care (EPOC) SRs (22, 23).
- Seven key SR methods documents were identified by searching websites of key SR organisations (24-30).
- The search methods used in three example reviews were assessed (31-33).
- Indexing terms were identified from a range of relevant databases.

Information on the availability of index terms, resources to search, other study identification methods suggested, search structure and the use of search filters are presented below.

Availability of indexing terms

Many databases offer controlled vocabulary terms (subject headings) for QE studies that might assist with searching for those study designs (Figure 2). Available subject headings reflect the concepts of pre-test post-test design and the general term ‘quasi experimental study’ is also

offered. Science Citation Index and Social Science Citation Index do not offer a controlled vocabulary.

Which resources should be searched?

The Cochrane Handbook (24) offers guidance on finding non-randomized studies (34). For Cochrane SRs the key principle of searching for studies is to identify all RCTs of the review question to minimize publication bias. This leads to sensitive search strategies (designed to find as many relevant studies as possible) conducted in as wide a range of resources as possible. The handbook recommends searching relevant rich resources such as Cochrane Review Group Registers and searching trial registers such as ClinicalTrials.gov (35). The Cochrane Handbook (24) lists resources that could be searched but does not suggest specific resources for QE studies.

AHRQ guidance for developing Comparative Effectiveness Reviews (CERs) (28) notes the absence of evidence on how to conduct a systematic search for observational studies and recommends that searches include SR databases, medical literature databases, specific organization and agency Web sites, and trials in registries.

The Institute of Medicine (IOM) recommends a standard for identifying studies (29), and notes that the SR protocol should make explicit which studies to include based on study design.

Search methods beyond database searching

The Cochrane handbook (24) provides advice on searching beyond bibliographic databases.

More recently, the Cochrane *Methodological Expectations of Cochrane Intervention*

Reviews (MECIR) suggest that searching for previous reviews of the review question to harvest studies and searching grey literature are highly desirable to identify studies, and that searching trials registers is mandatory for Cochrane reviews.

AHRQ guidance (28) and IOM (29) suggest that searches for grey literature (reports from government organisations, academics, business and industry in print and electronic formats) should be undertaken. AHRQ also encourages citation tracking, reading references, and interviewing key informants to learn about relevant journals or conferences.

Search strategy construction

AHRQ guidance (28) describes developing search strategies based on concepts identified in an analytic framework and the key questions and eligibility criteria that define the project. It notes that index terms for the study design concepts are often poor or non-existent.

The IOM (29) suggests including observational research (not necessarily synonymous with QE studies) in SRs when studying unexpected effects, intervention performance in everyday practice, or outcomes not evaluated in available RCTs. After explicitly documenting the justification for including observational studies, reviewers should work with librarians to search for observational research, such as cohort and case control studies, to supplement RCT findings.

Use of search filters

The Cochrane handbook (24) suggests the use of methodological search filters (terms to find study designs/methods) and search terms in relevant indexing fields, such as the Publication Type field in MEDLINE.

Three studies reported the development and 'validation' of search filters for some QE designs (18, 20-21). Fraser et al (20) observed that, in the absence of controlled vocabulary or publication types to identify non-RCT designs, text words must be used, which will not necessarily describe methodological aspects of the design. They used terms such as 'change*', 'evaluat*' and 'reviewed' in observational studies filter. When appropriate, the Cochrane EPOC Group incorporates QE designs such as controlled before and after (CBA) and interrupted time series (ITS) in its SRs (36). Former and current Trial search coordinators supporting EPOC authors confirm that the identification of non-RCT designs is challenging. Search filters tend to be database-specific and are often only provided for one database (https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/).

The Cochrane EPOC group has over time developed various filters to try to capture studies with CBA and ITS designs. The yield of example searches in finding relevant records in the EPOC database is shown in Table 2. The goal for filter performance for SRs is to achieve optimal sensitivity while maintaining reasonable precision, but EPOC trials search coordinators suggest that the current filters, developed after detailed assessment of relevant records, with combinations of single words or fairly literal phrases, are not working effectively for CBA and ITS designs. EPOC's plan is to use its reference set of approximately 1500 records to investigate other ways to find relevant studies, using Machine learning for example. However, new MeSH relevant to EPOC introduced in 2015 (non-RCTs, CBA and ITS) will be included in Medline filters that will be used prospectively.

Armstrong et al. have published guidelines for SRs of health promotion and public health interventions (30) that suggests studies can be identified using study design filters, but with reduced sensitivity. Searchers will make pragmatic decisions about filter use based upon

time and resources, but should report the use of study design filters so that potential limitations can be identified.

The EPPI-Centre Methods for Conducting Systematic Reviews (27) recommends against searching by study design, because the available indexing for study design in most databases tends to be patchy and imprecise. Using a study design search filter may not bring benefits in terms of improved precision (fewer irrelevant records) and may result in undesirable losses of sensitivity.

Campbell Collaboration searching guidance (26) suggests that search filters be used with caution when searching in the social sciences, because research (references not cited) has shown that social sciences databases tend not to be as thoroughly or consistently indexed as those in medicine. Social sciences abstracts often lack a description of study methods and therefore a broader approach to searching for methods content is required. Searching for specific study types along with general terms might be a more helpful way to limit searches. This can be achieved by using free text terms (study, studies, evaluation, control group*, random* etc.) on their own or combined with terms from study filters.

The AHRQ guidance for developing Comparative Effectiveness Reviews (CERs) (28) notes the inconsistent use of vocabulary to describe observational study designs. AHRQ recommends the use of validated study design search filters and directs researchers to published filters for observational study designs (18, 20-21),

Examples of search approaches from selected reviews

We explored search approaches used in specific relevant SRs to see whether we could derive any messages from practice. Reviews funded by the UK Department of International Development were identified from the Department's internet research register: Research for Development (R4D) (37). Only three reviews used explicit methods filters except for health-related SRs which used a filter for QE studies (30-33). The search approaches documented in Willey et al may be indicative of what happens in SRs of quasi-experimental studies. Willey reports an iterative approach which started with a focused strategy including a study design concept. Using terms in known papers indexed within MEDLINE the search strategy was developed and focused further, but the final strategy retained a study design concept for pragmatic reasons.

DISCUSSION

There is little published evidence on information retrieval methods for the conduct of systematic reviews of QE studies. The standard SR approach to searching, exemplified by the Cochrane Handbook, raises some fundamental questions of relevance to searching for QE studies. Do we need to search in the same way when conducting reviews of QE studies as we would when searching for RCTs? Specifically, do we need to search extensively, which usually involves sensitive strategies and searching a range of resources?

One key reason for extensive searching is to compensate for publication biases (38-43). It seems plausible that QE studies are at least as vulnerable to publication bias as RCTs. This is, in part, because some QE studies involve retrospective analysis of existing datasets rather than prospective data collection, so do not typically have protocols that can be registered

prospectively in study registers, to provide an audit trail indicating that a study has been conducted. However, there is currently little evidence of the extent of publication bias of QE studies and therefore of the need for extensive searching to minimize its effects. In the absence of evidence it seems wise to assume publication bias. Even if we do not need to find all QE studies we want to be sure that our strategies are good enough to find some. The following recommendations for practice are based largely on best practice in systematic reviews of RCTs and the recommendations for research are focused on providing an evidence base for SRs of QE studies.

Recommendations for practice: Extensive searching

Cochrane Collaboration and AHRQ guidance recommend the use of various search methods to identify relevant studies, searching beyond bibliographic databases. Information specialists should search for previous reviews on similar topics to identify studies and to learn from the experience of other reviewers. Systematic reviews can be identified from the Cochrane Library and also from PDQ-Evidence (44-45). Information specialists should use relevant rich resources of QE studies such as the registers of the Cochrane EPOC and Public Health groups.

Information specialists may find some value in searching clinical trials registers such as ClinicalTrials.gov, since several trial registries allow registration of observational studies: 17% of all studies registered in ClinicalTrials.gov in 2010 were observational studies (28).
Information specialists should consider searching for grey literature, in the absence of research evidence on its contribution to SRs of QE studies.

Recommendations for practice: Terminology and reporting

Given the range of terms which may signal that QE studies have been conducted and also the substantial number of reports where it is unclear whether a QE study has been conducted, it seems that retrieval will only become streamlined if changes in current practice are achieved. Firstly, we need more clarity on the terminology of QE studies used across different disciplines. There is a need for clearer definitions and for definitions to be stated more clearly within publications. Secondly, the form of QE should be stated in the title and abstract of publications to enhance retrieval from databases and search engines, where titles and abstracts are likely to be the only data available to search. These changes are likely to require facilitators. Researchers and journal editors should collaborate to develop a reporting standard similar to the CONSORT statement for the reporting of RCTs (46) or other guidance listed on the EQUATOR website (47). Journal editors in a wide range of journals in many disciplines, but especially in the social sciences, should commit to promoting the reporting guidance to authors, to achieve better reporting standards. Associations of editors in other disciplines should replicate the lead of the International Committee of Medical Journal Editors in the field of medicine in supporting CONSORT and other reporting guidance. This is likely to require a significant cultural change. The reporting guidance should contain advice for structured abstracts, to ensure that the dimension of study design is captured. These might include reporting the identification strategy (explaining the assumptions made to identify causal effects (8)), the data structure (how the data in the studies were collected) and the method of analysis (the statistical techniques used). Development of material on this aspect will probably be usefully informed by earlier articles in the series. Authors should be encouraged to adopt reporting standards through research which demonstrates that significant research investment is being wasted by non-retrieval of papers due to current inadequacies in reporting (48).

Linked to better reporting, database producers should introduce enhancements in database indexing to assist efficient retrieval of QE studies. As well as the introduction of indexing terms in those databases which do not currently offer them, indexing with currently available tools could be improved. Medline offers indexing terms for methods papers about non-randomized studies, such as **Non-Randomized Controlled Trials as Topic,** but this term may be applied inaccurately to reports of non-RCTs, creating inefficiencies in retrieval.

While awaiting these changes information specialists will need to develop sensitive search strategies, for the reasons outlined earlier, considering two inter-related issues: how should the strategy be constructed and should a QE study search filter be used. Information specialists should construct searches to capture the topics of their SR in a series of concepts. Topics addressed by QE studies may not always lend themselves to a single conceptual breakdown, such as the population combined with the intervention. Complex topics may require search strategies that reflect the complexity of the topic, leading to a series or sequence of searches with different combinations of concepts. In such a 'multi-stranded' approach, information specialists could consider including QE study design search terms in some of the strands (conceptual combinations), even though these might not be used with all conceptual combinations.

Recommendations for practice: study registration

Authors of SRs of QE studies should register their reviews in the PROSPERO database (49). An international collaboration should be developed to produce a register of primary QE studies. Many templates are on offer, including PROSPERO, and ClinicalTrials.gov. Such a register could be populated retrospectively with reports of completed QE studies derived from completed reviews of QE studies as exemplified by Epistemonikos and PDQ-update (45, 50). Authors of QE

studies could register their research with such a database and journal editors and research funders could endorse study registration in the database.

Recommendations for research: evidence is required, to change practice

Research to compare different ways of structuring searches for SRs of QE studies would help to provide guidance on best practice.

Research is required to learn how consistently databases with subject indexing for QE studies assign those headings to QE studies and reviews. The development of standardized search filters designed to identify reports of QE studies may be helpful. Search filter design methods are well developed and filters could be developed and validated using the relative recall approach (51). If those search filters do not perform adequately, for example not identifying significant proportions of the relative recall reference set, then the best construction of searches in the absence of study design filters needs to be investigated including the use of multi-stranded approaches where one strand uses study design terms.

Identifying which terms to include in a filter can involve a range of techniques. Snowballing (52), 'related record' search options, PubReminer (53), Endnote (54) and other tools can be used to identify candidate search terms. Text mining techniques, such as automatic term recognition, automatic document clustering and topic modelling could also be investigated as a promising means of semi-automating the process of generating, refining and expanding electronic search strategies for QE studies. This would involve applying text mining to a reference set of QE study records to identify those search terms (single word terms and pre-coordinated concepts) that perform well or poorly in discriminating between records of QE studies and other study records, and using this information to inform revisions to the strategy. Text mining techniques can also be

used to progressively refine and prioritize the results of an initially sensitive search for screening, in order to expedite the identification of potentially eligible study records.

Research is required to understand better which resources should be searched. Research is required to assess the value of a range of databases for finding QE studies and to identify whether some are richer than others, and the degree of overlap between resources. We note that overlap and redundancy are not necessarily bad things: having records available in more than one database increases the number of opportunities for retrieval. The value of searching the databases, grey literature sources and research registries in a range of disciplines should be assessed to gain information on volume, coverage, overlap and ease of searching, as well as their potential to minimise bias.

Research is required on the impact of publication bias through exploration of publication patterns of QE studies. Typical exemplars for research into publication patterns and bias are retrospective analyses of the publication fate of papers presented at conferences (55). These analyse differences in publications arising from the direction of the study results, nationality of authors and funding of the research. If a series of studies is undertaken and those studies are reviewed, a picture of the presence or absence of bias can be determined, and then the extent of searches required for SRs of QE studies can be better defined.

Limitations of this paper

This paper was informed by an extensive survey of the literature. We searched databases in a number of disciplines for relevant research, but inevitably more databases could have been searched such as REPEC (http://repec.org/). We searched using obvious highly relevant search terms and it might be that relevant studies that did not use those search terms might have been

missed. However, we note that the low yield of relevant research seems to be corroborated by the guidance documents we reviewed.

CONCLUSIONS

Searches involve two components: the search terms and the resources to be searched. To assess the first issue we have investigated whether a search focusing on methods and study design characteristics associated with QE studies is a reliable way to identify those studies Searches to identify QE studies are currently likely to rely on terms which capture the intervention and setting or population of interest, and are unlikely to be able to rely on using search terms to capture the QE designs. In terms of the resources to be searched, searches are likely to be required in a range of bibliographic databases and sources of grey literature. Although QE studies are numerous and currently difficult to retrieve, there are a range of initiatives which might improve their accessibility and promote SRs of what works based on the evidence from such studies. Investment in these initiatives and commitment to awareness raising would be required to achieve improvements in accessibility and use.

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Table 1: Resources searched to identify information retrieval research and practice

Resource	Purpose of search
Medline (Ovid): strategy presented in Figure 1. Searched 1946 to 11/10./13	To identify published research on identifying QE studies
EMBASE (Ovid) 1996-2013 week 40, searched 11/10/13	
PsycINFO 1987 to October Week 2 2013 Searched 11/10/13	
ERIC (Proquest) Searched 11/10/13	
Econlit (Ovid) 1961 to Sept 2013 Searched 11/10/13	
Criminal Justice Abstracts (EBSCO) Searched 11/10/13	
Social Services Abstracts (Proquest) Searched 11/10/13	
Cochrane Methodology Register (Cochrane Library) Searched 17/10/13	
Library, Information Science and TechnologyAbstracts (EBSCO) Searched 21/10/13	
InterTASC Search Filter Resource (https://sites.google.com/a/york.ac.uk/issg-search-filters-resource/home)	To identify search filters for QE studies
Cochrane Colloquia 1995-2011 were searched in the Cochrane Methodology Register (www.thecochranelibrary.com) and	To identify conference presentations on identifying QE studies
handsearched Colloquia abstracts for 2012 (titles available online) and 2013.(printed abstract book)	
Key systematic review guidance • Cochrane Collaboration Handbook [1] • CRD guidance [2] • Guide to information retrieval for Campbell Systematic Reviews [3] • EPPI-Centre Methods for Conducting Systematic Reviews [4] • AHRQ guidance [5] • IOM [6] • Armstrong R et al. [7]	To identify recommendations on searching for QE studies and current practices.
Selected systematic reviews identified from the R4D database (http://r4d.dfid.gov.uk/) • Willey B, et al. (2013) [8] • Grobler et al. (2009) [9] • Morgan C, et al. (2013) [10]	To identify examples of current practice.
Google search on health systems research synthesis	To identify research and current practice
Assessed the annual workshop devoted to health econometric methods including quasi randomized studies published in the journal *Health Economics*	To identify current practice
Identified the subject indexing and publication type terms relevant to quasi-experimental studies available in major databases: MEDLINE, Embase, PsycINFO, CINAHL, Global Health, Sociological Abstracts, Social Services Abstracts, EconLit, ERIC, Science Citation Index and Social Science Citation Index.	To identify whether searchers can use QE study indexing terms to search specific databases

Table 2: Effects of search strings in Medline (Ovid) tested by the EPOC Group

Search string	Number of records retrieved	Sensitivity in finding known ITS or CBA	Precision	Number needed to read
(PATIENT? or hospital$).hw. and (study or studies).ti,hw.	251,706	0.38 (114/297 ITS)	0.00045	2208
chang*	2,141,297	0.13 (36/297 ITS)	0.000017	59480
(controlled adj3 before adj3 after).ti,ab,	699	0.02 (8/409 CBA) 0 (0/297 ITS)	0.011 (CBA) 0 (ITS)	87 N/A
(((before adj10 (after or during)) and control).ti,ab.)	66721	0.14 (56/409 CBA) 0.081 (24/297 ITS)	0.00084 (CBA) 0.00036 (ITS)	1191 2780

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Figure 1: Strategy designed to search MEDLINE (Ovid) for records reporting on how to identify QE studies

1. information retrieval.ti,ab. OR (search or searched or searches or filter or filters or hedge or hedges or searching or database or databases).ti,ab. OR "Information Storage and Retrieval"/ OR Databases as topic/ OR Databases, bibliographic/ OR Pubmed/ OR Medline/ OR Vocabulary, controlled/ OR Subject Headings/ OR Medical Subject Headings/ OR (subject heading$1 or free text or text word$1).ti,ab.
2. (quasiexperiment$2 or quasi experiment$2).ti,ab. OR (exogenous variation$1).ti,ab. OR (natural experiment$2).ti,ab. OR (Matched controls).ti,ab. OR (Counterfactual outcome$1).ti,ab. OR (Rubin causal model$1).ti,ab. OR (potential outcomes model$1).ti,ab. OR (Identification adj (strategy or assumptions or conditions)).ti,ab. OR (conditional adj (independence or ignorability)).ti,ab. OR (unobserved heterogeneity).ti,ab. OR Unconfoundness.ti,ab. OR Confounding.ti,ab. OR (instrumental variable$1 adj (analysis or analyses or estimation)).ti,ab. OR (overidentification or overidentifying).ti,ab. OR (regression discontinuity analys$2).ti,ab. OR ((balancing or imbalance or balanced or imbalanced) adj3 covariates).ti,ab. OR (interrupted time series).ti,ab. OR (difference studies).ti,ab. OR (controlled adj3 before adj3 after).ti,ab. OR ((exact or score or genetic or nearest neighbor or nearest neighbour or caliper or radius or kernel density or blocking or stratification of interval) adj3 matching).ti,ab. OR ((Inverse probability weight$) adj4 (estimat$)).ti,ab. OR ((doubly robust) adj4 (regression or estimate$)).ti,ab. OR ((treatment or switching or selection or selectivity) adj3 regression).ti,ab. OR (selection model or selectivity model).ti,ab. OR (heckit model or heckman sample selection).ti,ab. OR (selection correction).ti,ab. OR (two stage residual inclusion).ti,ab. OR (regression discontinuity).ti,ab. OR (sharp design or fuzzy design).ti,ab. OR (Forcing variable$1).ti,ab. OR (difference$1 adj3 difference$1).ti,ab. OR (change$1 adj3 change$1).ti,ab. OR (Fixed effects and panel data).ti,ab. OR (full information maximum likelihood).ti,ab. OR ((health or economic) adj shock$1).ti,ab. OR (natural controls).ti,ab.

Figure 2: Subject indexing for QE studies available in major bibliographic databases (February 2014)

1. MEDLINE (Ovid)

Field: Keyword Heading (KW): note these are not Medical Subject Headings (MeSH).

- pretest-posttest study
- pretesting
- pre-post tests
- quasi experimental design
- quasi experimental study
- quasi experimental study design
- repeated measurement
- repeated measurements
- repeated measures

Figure(s)

- time series

2. EMBASE (Ovid)

- pretest posttest control group design
- pretest posttest design
- quasi experimental study
- time series analysis

3. PsycINFO (Ovid)

Field: Subject Headings (SH)

- pretesting
- posttesting
- quasi experimental methods
- repeated measures
- time series Field: Key Concepts (ID)
- posttest
- posttests
- post test
- post tests
- pretest
- pretests
- pre test
- pre tests
- pretest/posttest
- quasi experimental
- repeated measure
- repeated measurement
- repeated measurements
- repeated measures
- time series

4**. CINAHL (EbscoHost) Field: Subject Headings (MH)**

- multiple time series
- pretest-posttest control group design
- pretest-posttest design
- quasi-experimental studies
- repeated measures
- time series

Figure(s)

5. Global Health (CAB Direct) Field: Descriptor (DE)

- time series Field: Identifier (ID)
- quasi-experimental design

6. Sociological Abstracts (ProQuest) Field: Subject Headings (SU)

- time series analysis

Field: **Identifiers/keywords (IF)** (sometimes part of a longer identifier/keyword string)

- pretest-posttest
- quasi-experimental
- time series

7. Social Services Abstracts (ProQuest) Field: Subject Headings (SU)

- time series analysis

Field: **Identifiers/(keywords (IF)** (sometimes part of a longer identifier/keyword string)

- quasi-experimental

8. EconLit (ProQuest)

Field: **Subject (SU)** (sometimes part of a longer subject heading string)

- pretest
- pre test
- quasi-experiment
- quasi-experimental
- quasi-experiments
- quasi natural experiment
- quasi-randomized experiment
- quasi-randomized experiments
- time series

9. ERIC (ProQuest)

Field: **Subject Headings (SU)**

- Pretesting
- Pretests Posttests

Figure(s)

- quasiexperimental design

Field: **Identifiers/(keywords) (IF)** (sometimes part of a longer identifier/keyword string)

- quasi evaluation
- quasi experimentation
- quasi experimental method
- repeated measure design
- repeated measures design
- time series
- time series analysis
- time series design

10. Science Citation Index and Social Science Citation Index (ISI Web of Science)

Field: Topic (Includes Title, Abstract, Author Keywords, **Keywords Plus**)

- No relevant terms found

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