**Methods content checklists for STEM and medical and health sciences**

Methods checklists have been compiled below from an analysis of STEM and medical and health sciences texts and other sources[[1]](#footnote-1) to show the key information typically provided for different scientific methods in methods sections. What you include will depend upon your own unique study design. The lists should be read as prompts for your writing only, to be interpreted as relevant for your own study design.

**HEALTH AND MEDICAL**

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| **‘Big data’ from existing institutional source, observational epidemiology** | **Survey** | **Diagnostic/prognostic studies** | **Animal experimental biomedical studies** | **Clinical experimental biomedical studies** |
| -Trends, patterns, indicators to be observed  -Data source―organisation/data set name, setting, location, level of organisation  -How accessed  -Type of information/bioresource selected  -Time period of data slice  -Description of subgroups, interactions, comparisons to be made  -Sample criteria and characteristics, inc. for different grps  -How data accuracy assessed (inc. ‘data cleaning’ or data validation methods)  -How data bias due to confounding factors or selection will be avoided  -Theories or assumptions to be tested  -Extent and level of generalizability | -Sample characteristics  -Sample size approx.  -Extent, level of generalisability  -How accessed, distributed  -Foci—whether behaviour, actions, attitudes, abilities, health outcomes, other?  -Scales, questionnaires, psychometric tests to be used, inc. items borrowed from other authors (include references)  -How developed  -Type of design—Likert, Delphi, open ended, multiple choice, other?  -How survey will be delivered and collected  -How data will be analysed—tests used, reliability and validity | -Test use―whether diagnosis, screening, staging, monitoring, surveillance, prediction, prognosis?  -Clinical role relative to existing tests―whether replacement, triage (before existing test), add-on (after existing test)  -Whether data collected before (prospective study) or after (retrospective study) tests  -Participant eligibility criteria, how identified (symptoms, previous test results, registry), where and when identified (setting, location, dates), whether consecutive, random or convenience series  -Tests―Index and reference ‘gold’ standard, why chosen  -Analysis―Methods for estimating, comparing diagnostic accuracy measures  -Intended sample size, how determined | -Animals―inc. source, methods of selection, owners/managers  -Preparation  -Study design—questions asked, independent and dependent variable/s, controls (baseline, control series, sham experiments, placebo), nature of experiment/s, order and duration of interventions, measurements, sample size approx., how accessed, potential confounders by grp  -Measurement method  -Calculations  -Analysis of data | -Study subjects  -Inclusion criteria  -Exclusion criteria  -Recruitment  -Study design—questions asked, independent and dependent variable/s, controls (baseline, control series, sham experiments, placebo), nature of experiment/s, order and duration of interventions, measurements, sample size approx., how accessed, potential confounders by grp  -Measurement methods  -Calculations  -Analysis of data |

**Information about materials and human/animal subjects to be included for health research**

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| **Drugs** | **Culture, media,**  **buffers, gases** | **Experimental material** | **Animals** | **Human subjects** |
| -Generic name, manufacturer, purity, concentration, solvent, pH temperature, total volume infused, rate of infusion, amount of drug administered per kilogram body weight, duration of injection, concentration in fluid | -Components, concentrations, temperature, volume, pH, flow rate | -Specify molecule, cell line, tissue  -Bioresource/s―name, relevant characteristics, sample number, type of biospecimen/s  -MTA (Material Transfer Agreement) and DTA (Data Transfer Agreement),  record reference ID/organization or network partnership for MTA and DTA, date of access from biobanks  name/description of digital resource, database, dataset, or registry if known | -Species, weight, strain, sex, age, details of sedation and anesthesia (agent used, amount, route, administration—single, repeated, or continuous —depth of anesthesia and how assessed, why anesthesia not used if not, ethical rationale and approval for process | -Eligibility criteria―age, sex, socio-economic background, genetic profile and variants, height, weight, state of health or disease  -Diagnostic criteria/test used to identify target disease or condition,  (test, procedure, observation, expert judgement, or combination).  -Specific medical and surgical management  -How selected,  -Ethical considerations and approval |

**STEM**

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| **Experimental Engineering, IT, applied mathematics** |
| -Description of new method—for methods testing  -Test site—location, description, why chosen  -Samples used—how many, where collected, name of supplier, why chosen, characteristics/description, intervals, treatment, selection  -Built test site—why built, description/measures, method of construction, variations  -Tests conducted—type, name, where conducted  -Test procedure—quantities, temperature, duration, sequence, location, procedure, size  -Equipment used—name, what it will be used for, important features, measures/description of equipment capacity  -Data collection—how recorded, when, number of sequences  -Problems likely to be encountered and solutions  -Data analysis—name of organization undertaking any analysis, what analysis aims to identify, standards referred to in analysis, excluded data, intervals at which data will be collected  -Formulas, models, calculations  -Statistical software―package(s), version and settings used |

**QUALITATIVE RESEARCH**

Qualitative research methods typically aim to understand some aspect of human experience and the meanings people attach to their experience. The type of content that needs to be provided for interview, observation-based or focus group methods includes:

* questions/aims,
* rationale for choice of method (see below),
* who will be interviewed or observed,
* why this sample
* how many approximately,
* length and type of interview or focus group,
* focus of questions,
* or for observational research, what type of, where, and when observations will occur,
* how data will be collected and recorded,
* how data will be processed,
* how data will be analysed.

Some typical rationales for using qualitative methods are listed below.

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| **Rationale for interview-based research:** | **Rationale for observation-based research:** | **Rationale for focus groups―**Focus groups are usually used when fast and relatively impersonal information is needed, or when the group dynamic is of interest to the research. |
| * reveal how individuals interpret or construct meaning, * reveal individual experience, social conditions or a given phenomenon, * reveal an ‘insider’ perspective, or ‘authentic’ account, * overcome potential biases, distortions or occlusions in how experience is represented in existing survey-based or other research on the subject arising from the questions, definitions, categories, concepts, language used, or by the way data has been collected. | observe multiple human actions, events, roles, or situations, not possible with interviews, focus group or survey methods | Common rationales for focus groups include:   * get feedback from expert groups to assist in the development of surveys or other research tools; * stimulate and gather beliefs, responses, feedback, reactions to phenomena; * generate ideas and stimulate memories via interaction and group discussion that interviews alone would not capture; * stimulate and validate participant disclosures to empower group members; * observe dynamic behaviour, interactions or power differences and alliances among participants; * produce group consensus or solutions. |

1. Inclusive of Zeiger, M. 2000. *Essentials of writing biomedical research papers*, McGraw-Hill, New York, and Equator Network: <https://www.equator-network.org/> [↑](#footnote-ref-1)