Bias in research

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Bias exists in all study designs, and although researchers should attempt to minimise bias, outlining potential sources of bias enables greater critical evaluation of the research findings and conclusions. Researchers bring to each study their experiences, ideas, prejudices and personal philosophies, which if accounted for in advance of the study, enhance the transparency of possible research bias. Clearly articulating the rationale for and choosing an appropriate research design to meet the study aims can reduce common pitfalls in relation to bias. Ethics committees have an important role in considering whether the research design and methodological approaches are biased, and suitable to address the problem being explored. Feedback from peers, funding bodies and ethics committees is an essential part of designing research studies, and often provides valuable practical guidance in developing robust research.

In quantitative studies, selection bias is often reduced by the random selection of participants, and in the case of clinical trials randomisation of participants into comparison groups. However, not accounting for participants who withdraw from the study or are lost to follow-up can result in sample bias or change the characteristics of participants in comparison groups. In qualitative research, purposeful sampling has advantages when compared with convenience sampling in that bias is reduced because the sample is constantly refined to meet the study aims. Premature closure of the selection of participants before analysis is complete can threaten the validity of a qualitative study. This can be overcome by continuing to recruit new participants into the study during data analysis until no new information emerges, known as data saturation.

In quantitative studies having a well-designed research protocol explicitly outlining data collection and analysis can assist in reducing bias. Feasibility studies are often undertaken to refine protocols and procedures. Bias can be reduced by maximising follow-up and where appropriate in randomised control trials analysis should be based on the intention-to-treat principle, a strategy that assesses clinical effectiveness because not everyone complies with treatment and the treatment people receive may be changed according to how they respond. Qualitative research has been criticised for lacking transparency in relation to the analytical processes employed. Qualitative researchers must demonstrate rigour, associated with openness, relevance to practice and congruence of the methodological approach. Although other researchers may interpret the data differently, appreciating and understanding how the themes were developed is an essential part of demonstrating the robustness of the findings. Reducing bias can include respondent validation, constant comparisons across participant accounts, representing deviant cases and outliers, prolonged involvement or persistent...
Design bias

Poor study design and incongruence between aims and methods increases the likelihood of bias. For example, exploring HIV testing using a survey is unlikely to obtain in-depth rich data about individuals’ experiences. Bias can occur when a researcher’s personal beliefs influence the choice of research question and methodology. For example, a researcher working for a pharmaceutical company may choose a research question which supports the usefulness of the drug being investigated.

Selection/participant bias

Selection bias relates to both the process of recruiting participants and study inclusion criteria. Successful research begins with recruiting participants who meet the study aims. For example, recruitment bias could occur if participants were invited to participate in a survey posted on the internet, which automatically excludes individuals without internet access.

Inclusion bias in quantitative research typically relates to selecting participants who are representative of the study population, and where applicable allocation of participants to ensure similarity between comparison groups. In addition, accounting for the differences between people who remain in a study and those who withdraw may be important in some study designs. For example, an evaluation of a weight loss programme may be affected by participant withdrawal; participants who become disillusioned because of not losing weight may drop out, which may bias the findings towards more favourable results.

Confounding bias can also occur because of an association between ‘cause’ and ‘effect’. For example, comparing treatment outcomes for similar conditions between general and specialised centres may find higher mortality rates at specialised centres yet patients referred to these centres are more likely to have high-risk factors and more complex needs. In qualitative research, it is usual to recruit participants with a range of experiences in relation to the topic being explored; therefore, accounting for biases in relation to the sampling strategies is essential. For example recruiting parents from a parent and toddler group is likely to be biased towards mothers; the findings are unlikely to represent both mothers’ and fathers’ perspectives.

Data collection bias and measurement bias

Data collection bias can occur when a researcher’s personal beliefs influence the way information or data is collected.

In quantitative studies, measurement bias can occur if a tool or instrument: has not been assessed for its validity or reliability (e.g., using a shared decision-making tool that measures patient satisfaction rather than decision-making); is not suitable for the specific setting or patient groups (e.g., using an adult verbal pain assessment tool with young children); an instrument not calibrated properly may consistently measure inaccurately (e.g., weighing babies with poorly calibrated weighing scales); In retrospective studies, for example, when completing questionnaires about eating habits when data collection relies on recall, participants may not remember and report events accurately.

In qualitative research, interviewing is a commonly used method of data collection; how questions are asked will influence the information elicited. For example a leading question, “Do you find the health service poor?”, is likely to receive a closed yes or no response, and not gain insight into participants experiences and could be replaced with; “Please describe your last visit to hospital!”

Analysis bias

When analysing data, the researcher may naturally look for data that confirm their hypotheses or confirm personal experience, overlooking data inconsistent with personal beliefs.

Publication bias

Published studies nearly always have some degree of bias. For example, in quantitative research, studies are more likely to be published if reporting statistically significant findings. Non-publication in qualitative studies is more likely to occur because of a lack of depth when describing study methodologies and findings are not clearly presented.

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