Supplementary Information

Guidelines for reporting intersectional analysis in science and technology (GRIST)

Title & Abstract

In studies where intersectional analysis is central, signal that in the title. Where intersectional analysis is included in results, indicate this in the abstract and specify the populations and socio-political dimensions covered.

Introduction

Specify the background, rationale, specific objectives and hypotheses for any part of your study that includes an intersectional analysis. While not relevant to all research, intersectional analysis is often central in studies addressing questions with human implications, such as environmental impacts or the safety and fairness of technical systems. Detail the socio-political dimensions covered and consider how they may reflect relationships of power, privilege and disadvantage.

Methods

Strong intersectional research hinges on quality socio-demographic data, requiring careful consideration of the categories that structure the data and the systems of power that might have shaped them. For *socio-political dimensions,* offer precise, operational definitions of each individual dimension. Note that some dimensions have sub-variables, e.g. gender or race. Specify which are considered and justify your choice. When you cannot account for relevant dimensions, explain the barriers encountered (e.g. in terms of data availability or methodological challenges). Describe how you measure the dimensions (e.g. self-report, census or administrative data, extrapolations from AI models as continuous variables or probabilities). Take care not to use proxy variables for the dimensions (e.g., sex assigned at birth should not be a proxy for gender identity). When proxies are necessary, as in cases where data access is limited or could compromise participant safety, discuss why and how they are used and highlight potential caveats.

Contextual domains. Consider how socio-political dimensions shape and are shaped by broader contextual domains, such as laws, healthcare systems, educational institutions, criminal justice systems, religious bodies that contribute to socio-cultural advantages and disadvantages.

Environmental conditions. Consider local and global environmental dynamics, such as air-, soil- and water-quality, that may offer novel perspectives in intersectional analysis, and vice versa.

Describe the methods used to analyse interactions across dimensions, domains and conditions, and specify the required sample sizes for each group and level to secure sufficient statistical power. Intersectional statistical methods are usually multiplicative, not additive, implying a focus on compounded effects. Additive methods provide estimates for each variable but ignore their interdependent effects, while intersectional approaches seek to understand the combined, or multiplicative, effects of these variables. Methods, such as multi-level models, decomposition techniques or multicalibration, allow the investigator to move beyond a mere focus on multiplicative effects in intersectional analysis. Efforts to ensure fairness in models and technical systems often require iterative analyses to monitor that improvement on one parameter (e.g. sex, gender, ethnicity, geographical location, etc.) does not result in widened disparities on another.

Results

Detail the sample's composition across the covered intersectional dimensions. Disclose all outcomes from the intersectional analysis, including those that are inconclusive and null results. When presenting sub-group comparisons or interaction analyses, report details on within-group variability and the overlap between groups, to avoid overemphasizing intersectional differences. Provide sufficient detail to allow readers to interpret outcomes and their practical significance. Raw data, particularly those that are difficult to access, should be made accessible for future research and meta-analysis, with an emphasis on ensuring anonymity; for example, "anonymized" data containing individual-level details like zip code, birth date, ethnicity and sex (in combination) may inadvertently allow for the re-identification of individuals.

Discussion

Summarise the key results emerging from the intersectional analysis, where relevant. Discuss specific limitations whether due to the study's scale, data limitations or other factors. Indicate where an intersectional analysis was hypothesized but not possible and discuss how this knowledge gap affects potential policy directions. Discuss how the results from the studied population may or may not generalised to other populations. Contextualize how the findings connect to questions of power, privilege, inequity and the specific contextual circumstances of the target populations. Highlight how your intersectional analysis has enhanced scientific accuracy, and, where relevant, how the resulting insights could lead to more equitable technological solutions or environmental policy interventions.