

SEGRESS: The PRISMA 2020-Inspired Structured Checklist for Reporting SE Secondary Studies

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THE SEGRESS guidelines and a description of their development (see Figure in the left column) are presented in an open access paper that can be downloaded from the IEEE TSE / Xplore web site:

Barbara Kitchenham, Lech Madeyski, and David Budgen. "SEGRESS: Software Engineering Guidelines for REporting Secondary Studies". In: *IEEE Transactions on Software Engineering* 49.3 (2023), pp. 1273–1298. DOI: [10.1109/TSE.2022.3174092](https://doi.org/10.1109/TSE.2022.3174092). URL: <https://doi.org/10.1109/TSE.2022.3174092>

The use of the guidelines is illustrated through worked examples that form the basis for the Supplementary Material that is available online at:

Barbara Kitchenham, Lech Madeyski, and David Budgen. *Supplementary Material for SEGRESS: Software Engineering Guidelines for REporting Secondary Studies*. 2022. URL: <https://madeyski.e-informatyka.pl/download/SEGRESS22supplement.pdf>

The most important part of the SEGRESS paper is Table 9, which is reproduced below, and presents the structured checklist for reporting software engineering secondary studies. Please note that, following PRISMA 2020, we have adopted the terms "Risk of Bias" (RoB) as a replacement for the term "Quality Assessment", and "Limitations" as a replacement for "Threats to Validity". Both of these are considered to be more appropriate descriptions to use in the context of a secondary study. The reasoning behind this is discussed more fully in our paper. Also, all references in the table are to the Supplementary Material [3], which provides explanations of the sections with the aid of examples.

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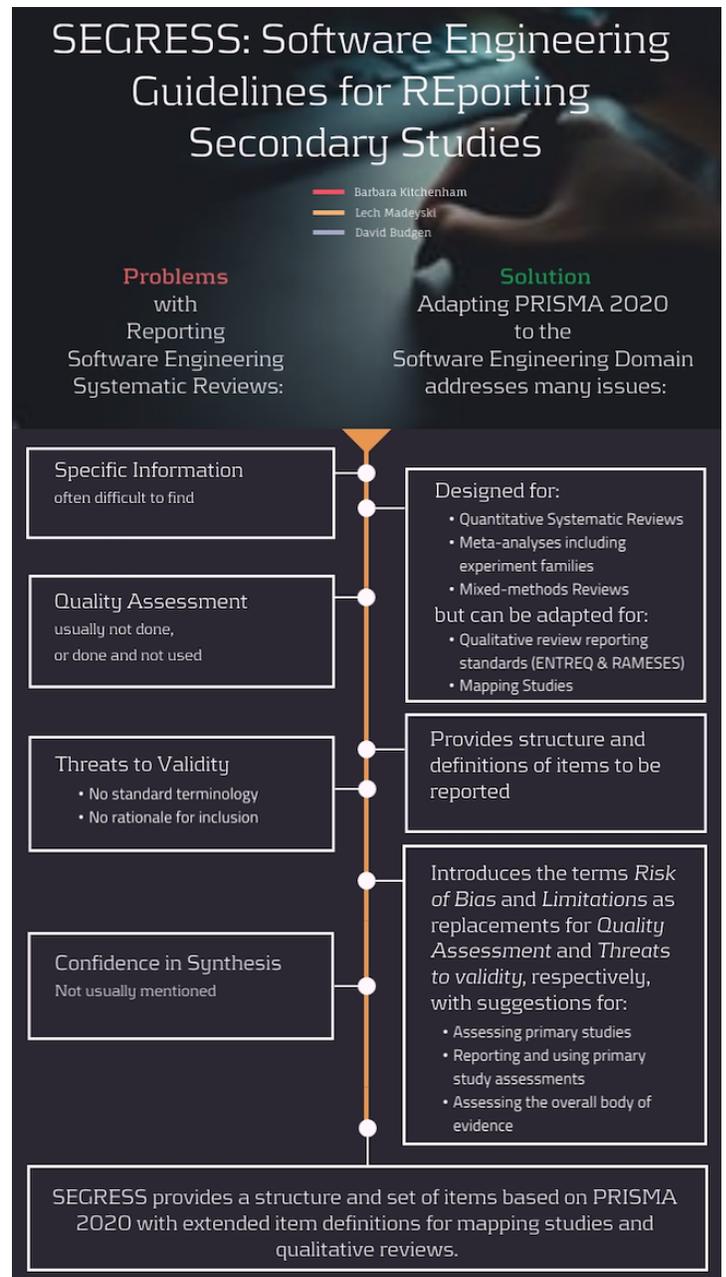


TABLE 1. SEGRESS: The PRISMA 2020-inspired structured checklist for reporting SE secondary studies

Section	PRISMA Description Item	
Full Report		<i>Use of SEGRESS may result in long documents. For publication purposes, authors should consider referencing material in the protocol, publishing some material in supplementary material, and reporting any large-scale model building exercise separately from the basic SR report.</i>
Title		Identify both the report topic and type of secondary study, so potential readers can find the report.
Title	1	Identify the report as a systematic review, systematic mapping study, tertiary study, qualitative review, or mixed-methods review and specify the topic being reviewed, see explanation and examples in [3, Sec. 2.1]. Required for all review types.
Abstract		Provide a summary of the entire report, so potential readers can easily assess its relevance.
Structured abstract	2	Provide a structured summary incl.: Background (emphasizing the importance of this research), Objective, Methods, Results, Limitations (optional), Conclusion. Guidelines for constructing an abstract can be found in [6, Table 2] and [5, Box 2] and are discussed in the SEGRESS Supplementary Material [3, Sec. 2.2]. Required for all review types.
Introduction		Set context for the work.
Opening		Introduce the larger problem the paper is targeting, lay out a broad context for the work, and highlight the importance of the work to a large audience. In subsequent steps define the research area, establish a niche within the area (knowledge gap), and then focus on the niche.
Rationale	3	Describe information the reader needs to understand the work the authors did, why it is important, i.e., the rationale for the study (e.g., update, new topic area, new empirical results, mature topic having no previous systematic review) and how it contributes to the larger problem, see explanation and example in [3, Sec. 2.3]. Required for all review types.
Objectives	4	Specify the research questions, explaining how they contribute to the larger problem, see [3, Sec. 2.4]. Required for all review types.
Methods		Outline procedures you followed and resources you used to conduct your work.
Eligibility criteria	5	Use the study characteristics to define eligibility criteria based on the intervention or topic of interest [3, Sec. 3.1]. Criteria used to restrict the search must be specified and justified (e.g., search start and end dates, language limitations, journal restrictions, publication restrictions). Specify how any existing systematic reviews and/or qualitative reviews on the topic of interest, found by the search process, will be used. Required for all review types. Tertiary mapping studies investigating research trends must justify search restrictions, such as limiting inclusion to papers in high quality journals, in terms of the study RQs.
Information sources	6	Describe all information sources, databases, primary study references, and others (e.g., researchers) with search end dates. The Supplementary Material [3, Sec. 3.4] includes a checklist for reporting the search process based on the PRISMA-S guide [7]. See [1] for guidelines for incorporating grey material. Required for all review types.
Search Strategy	7	Present full search strategy, including, as appropriate, electronic search strings, snowballing, manual search, finding unpublished materials, and any method(s) used to assess achieved completeness. If previous reviews exist, explain how they have contributed to the current search process. The Supplementary Material [3, Sec. 3.5] includes a checklist for reporting the search process based on the PRISMA-S guide [7]. Required for all review types. Qualitative reviews should explain any search processes aimed at finding deviant cases and exceptions and any exploratory scoping of the literature.
Selection Process	8	State the process for selecting studies, including the specific phases of the selection process, the number of assessors per study, methods of handling disagreements, any tools used, and any methods of assessing agreement rates [3, Sec. 3.6]. Required for all review types. Qualitative studies should explain exclusions that relate to synthesis issues rather than eligibility criteria.
Data Collection Process	9	Specify the method used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and, if applicable, details of automation tools used in the process [3, Sec. 3.7]. Required for all review types. For qualitative reviews, indicate which areas of each primary study were analysed.
Data items	10a	List, define and justify all outcomes for which data was sought, explaining their relationship to the research questions [3, Sec. 3.8]. Required for all review types except mapping studies, because they do not analyse primary study outcomes.
	10b	List and define all non-outcome variables for which data was sought (e.g., participant and intervention characteristics, funding source). Describe any assumptions made about any missing or unclear information [3, Sec. 3.9]. Required for all review types. For mapping studies define any classification systems used to categorize the data items and confirm how the data item relates to the research questions.
Study Risk Of Bias Assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and, if applicable, details of automation tools used in the process [3, Sec. 3.10]. This is optional for mapping studies, but required for all other review types.
Effect Measures	12	Specify for each outcome the effect measure(s) (e.g., risk ratio, mean difference) used in the synthesis or presentation of results [3, Sec. 3.11]. This is required for quantitative reviews and meta-analyses. It is sometimes reported by mapping studies, depending on the research questions (e.g., if the research question involves identifying the definitions of outcome metrics used in empirical studies). It is not required for qualitative reviews.
Analysis and Synthesis methods	13	Quantitative SRs and qualitative reviews should report the methods used for synthesis of primary study outcomes [3, Sec. 3.12]. Mapping studies should report the methods used to analyse primary study characteristics.
	13a	Describe the process used to decide which studies were eligible for each synthesis [3, Sec. 3.13].
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling missing summary statistics, or data conversions [3, Sec. 3.14]. Not required for mapping studies. Qualitative studies should describe the coding processes adopted and specify whether it was inductive (i.e., based on deriving the code from the raw textual data, which is typical for grounded theory analyses), or deductive (i.e., based on pre-existing themes or theories).
	13c	Describe any methods used to tabulate or visually display results of individual studies and synthesis [3, Sec. 3.15]. Required for all review types. For mapping studies describe the methods used to prepare tables, graphs and maps of study characteristics.
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s) [3, Sec. 3.16]. Required for all types of review except mapping studies. If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of heterogeneity, and the software packages(s) used. Qualitative studies should, where necessary, identify constructs analyzed, explain how findings from different studies were compared, and specify how synthesized findings were validated.

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Section	PRISMA Description Item	Description
	13e	Describe any sensitivity analysis conducted to assess robustness of the synthesized results [3, Sec. 3.17]. Formal procedures are available for quantitative synthesis and mixed-methods analysis, such as removing high influence data points. For qualitative methods, this involves discussing the impact of any deviant cases and exceptions on the synthesized findings. Not required for mapping studies.
	13f	Describe any methods used to explore possible causes of heterogeneity among study results [3, Sec. 3.18]. Required for all types of review except mapping studies.
Reporting Bias Assessment	14	Describe any methods used to assess risk of bias due to publication bias [3, Sec. 3.19]. Not required for mapping studies, or secondary studies investigating SE research practices rather than SE development and maintenance methods.
Certainty Assessment	15	Describe methods used to assess certainty (or confidence) in the body of evidence for an outcome (e.g., GRADE) [3, Sec. 3.20]. Not required for mapping studies or secondary studies investigating SE research practices, but essential for all other review types. See Section 3.3.3 and Section 5.1.3.
Results		Communicate complex, quantitative and qualitative information in an easy to read manner.
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram [3, Sec. 4.1]. Report agreement statistics, if collected. Required for all review types. Qualitative studies should describe any iteration between selection and synthesis.
	16b	Cite studies that met many but not all inclusion criteria ('near-misses') and explain why they were excluded [3, Sec. 4.2]. Optional for mapping studies, required for all other review types. Qualitative reviews should identify any eligible studies that were excluded from synthesis and justify the exclusions.
	[17-22]	<i>Reporting Style: If reporting syntheses (i.e., meta-analysis results or answers to research questions) obtained from different subgroups of primary studies or different research questions consider using an iterative reporting approach, keeping items 17 to 22 together for primary studies subgroups or specific research questions. Note that, even if using an iterative style for reporting, it may be appropriate to report information that was obtained from every primary study in integrated tables. The issue is that risk of bias among contributing primary studies will be different for different syntheses if they depend on different subsets of studies.</i>
Study characteristics	17	Describe the characteristics of each included study, and provide citations [3, Sec. 4.3]. Required for all review types.
Risk of Bias in Studies	18	Present data on the risk assessment for each study [3, Sec. 4.4]. Report agreement statistics. Optional for mapping studies but required for all other review types.
Results of individual studies	19	For quantitative reviews, for all outcomes, present for each study [3, Sec. 4.5]: a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g., confidence/credible interval), ideally using structure tables or plots. For qualitative reviews, present the major findings from each study included in the synthesis. Not usually required for mapping studies.
Results of Analyses and Syntheses	20	Quantitative SRs and qualitative reviews should describe the results of their syntheses [3, Sec. 4.6]. Mapping studies should report their analyses of primary study characteristics.
	20a	Report each synthesis, briefly summarising the characteristics and risk of bias among contributing studies [3, Sec. 4.7]. Required for all review types. For qualitative studies, define any derived themes, and focus on theory building and testing. Provide appropriate quotations specifying the primary study from which the quotation was obtained, and whether it was produced by the study authors or individual study participants. For mapping studies, discuss the maps and tables produced to address each research question.
	20b	Present results of all statistical syntheses conducted [3, Sec. 4.8]. If meta-analysis was performed, present for each analysis, the summary estimate and its precision (e.g., confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. Only required for quantitative reviews.
	20c	Present results of all sensitivity analysis conducted to assess the robustness of the synthesized results [3, Sec. 4.9]. Qualitative studies should discuss deviant cases and exceptions and should report any additional validation of qualitative models.
	20d	Present results of all investigations of possible causes of heterogeneity among study results [3, Sec. 4.10]. Not required for mapping studies. Other review types should attempt to identify qualitative factors that might explain different primary study outcomes.
Reporting Biases	21	Report results of assessing publication bias for each synthesis [3, Sec. 4.11]. For meta-analysis, report the heterogeneity among studies and provide funnel plots. Not usually required for mapping studies or qualitative studies.
Certainty of Evidence	22	Present assessment of certainty (or confidence) in the body of evidence for each reported finding [3, Sec. 4.12]. Not required for mapping studies. Required for all other review types.
Discussion		Turn data into knowledge (i.e., advice or recommendations for practitioners, academics, and educators), point out how your results provide novel understanding, challenge previous knowledge, or resolve persisting controversy answering questions raised in the Introduction.
Discussion	23a	Provide a general interpretation of the results in the context of other evidence [3, Sec. 5.2]. Where applicable compare review findings with other reviews on the same topic. Required for all review types.
	23b	Discuss any limitations of the evidence included in the review [3, Sec. 5.3]. Required for quantitative and qualitative reviews. Not required for mapping studies.
	23c	Discuss any limitations of the review process used [3, Sec. 5.4]. Required for all reviews, but include only those issues that were not previously addressed as part of the description of the review process or when discussing the synthesis results.
	23d	Discuss implications of the results for practice, policy and future research [3, Sec. 5.5]. Required for all review types. For mapping studies, only discussion of future research is relevant.
Registration and Protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered [3, Sec. 6.2]. Guidelines for constructing an SR protocol can be found in the PRISMA-P statement [8]. Optional for all review types.
	24b	Indicate where the review protocol can be accessed or state why no protocol is available [3, Sec. 6.3]. Optional for mapping studies, required for all other review types.
	24c	Describe and explain any amendments to information provided at registration or in the protocol [3, Sec. 6.4]. Required for quantitative and qualitative review types, optional for mapping studies.
Support	25	Describe sources of financial and non-financial support for the review and the role of the funders or sponsors of the review [3, Sec. 6.5]. Required for all review types.
Competing Interests	26	Declare competing interests of the review authors [3, Sec. 6.6]. Required for all review types.
Availability Of Data, Code and Other Materials	27	Report which of the following are publicly available and where they can be found (e.g., Zenodo, Figshare, Dryad): template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review or to produce the review (e.g., Rnw file if using R scripts or code chunks as analytic code) [3, Sec. 6.7] [4]. Optional but recommended for all review types.

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