

Risk of Bias Code System Concept List

Type Categories

<u>Category</u>	<u>Concept Name (Alternative Terms)*</u>	<u>Source</u>
Type Classifier	<b>Choice-of-Question Bias</b>	Jadad <sup>1</sup>
Choice-of-Question Bias	Hidden agenda bias	Jadad <sup>1</sup>
	Predetermined result bias (Self-fulfilling prophecy bias, Shape the result bias)	Jadad <sup>1</sup>
	Cost and convenience bias	Jadad <sup>1</sup>
	Funding availability bias	Jadad <sup>1</sup>
	Secondary gains bias	Jadad <sup>1</sup>
	Regulation bias	Jadad <sup>1</sup>
	Wrong design bias	Jadad <sup>1</sup>
	Population choice bias	Jadad <sup>1</sup>
	Intervention choice bias	Jadad <sup>1</sup>
	Comparator choice bias	Jadad <sup>1</sup>
	Outcome choice bias	Jadad <sup>1</sup>
Type Classifier	<b>Selection Bias</b>	
Selection Bias	<b>Participant Selection Bias</b>	CoB, PROBAST, QUADAS-2, QUIPS, ROBINS-I
	<b>Study Selection Bias</b>	ROBIS
Selection Bias, Participant Selection Bias	Inappropriate selection criteria	MMAT, Newcastle, PROBAST, QUADAS-2, QUIPS,
	Biased sampling strategy	Newcastle, PROBAST, QUADAS-2, QUIPS
	<b>Non-representative sample</b>	Cochrane ROB DTA, MMAT, Newcastle, PROBAST, QUADAS-2, QUIPS
	Inadequate participation by eligible persons	QUIPS

	Post-intervention factors bias selection	ROBINS-I
	Intervention associated with post-intervention factors that bias selection	ROBINS-I
	Outcome associated with post-intervention factors that bias selection	ROBINS-I
	Mismatch in start of intervention and start of follow-up	ROBINS-I
Selection Bias, Participant Selection Bias, Non-representative sample	Admission rate bias	CoB
	Centripetal bias	CoB
	Chronological bias	CoB
	Informed presence bias	CoB
	Non-response bias	CoB
	Popularity bias	CoB
	Prevalence-incidence bias (Survivor bias)	CoB
	Referral filter bias	CoB
	Spectrum bias	CoB
	Starting time bias (within cohort)	CoB
	Volunteer bias	CoB
Selection Bias, Study Selection Bias	<b>Bias in Study Eligibility Criteria</b>	
	Database search sources not appropriate	ROBIS
	Non-database search sources inadequate	ROBIS
	Search strategy not sensitive	ROBIS
	Search strategy limits for information sources not appropriate	ROBIS
	Study eligibility criteria not adhered to	ROBIS
	Error in study selection not minimized	ROBIS

	Language bias	CoB
	Geography bias	Jadad <sup>1</sup>
	One-sided reference bias	CoB
	Publication Bias affecting study selection	CoB
Selection Bias, Study Selection Bias, Bias in Study Eligibility Criteria	Study eligibility criteria not prespecified	ROBIS
	Study eligibility criteria not appropriate for review question	ROBIS
	Study eligibility criteria ambiguous	ROBIS
	Study eligibility criteria limits for study characteristics not appropriate	ROBIS
	Study eligibility criteria limits for information sources not appropriate	ROBIS
Type Classifier	<b>Comparator Selection Bias (Allocation Bias)</b>	CoB, MMAT, ROB1, ROB2, ROBINS-I
Comparator Selection Bias	Inadequate Random sequence generation	ROB1, ROB2
	Inadequate Allocation concealment	COKA, ROB1, ROB2
	Biased selection of the non-exposed cohort	Newcastle
	<b>Case-control design</b>	QUADAS-2
	<b>Potential for Confounding (Confounding)</b>	CoB, Newcastle, ROBINS-I
Comparator Selection Bias, Case-control design	Case-control design without appropriate definition of controls	Newcastle
	Case-control design without appropriate selection of controls	Newcastle
	Case-control design without description of selection of controls	Newcastle

	Case-control design with factor-specific concern for comparability of cases and controls	Newcastle
	Non-contemporaneous control bias	CoB
Comparator Selection Bias, Potential for Confounding	Baseline differences	COKA, MMAT, ROB2
	Confounding by follow-up time	ROBINS-I
	Lead time bias (Starting time bias between groups)	Hutchison <sup>2</sup>
	Prognostic factors influencing intervention	ROBINS-I
	Post-intervention confounding	ROBINS-I
	Confounding by indication	CoB
Type Classifier	<b>Performance Bias</b>	CoB, ROB1, ROB2, ROBINS-I
Performance Bias	Inadequate blinding of participants (Lack of blinding)	CoB, COKA, ROB1, ROB2
	Inadequate blinding of intervention deliverers (Lack of blinding)	CoB, COKA, ROB1, ROB2
	Deviations from intended intervention	MMAT, ROB2, ROBINS-I
	Imbalance in deviations from intended interventions	ROB2, ROBINS-I
	<b>Performance Adherence Bias (Compliance Bias)</b>	CoB, MMAT, ROB2
Performance Bias, Performance Adherence Bias	Performance Adherence Bias - Blinding of Participants	ROB2
	Performance Adherence Bias - Blinding of Intervention Deliverers	ROB2
	Performance Adherence Bias - Imbalance in Deviations from intended Intervention	ROB2, ROBINS-I
	Performance Adherence Bias - Nonadherence of Implementation	ROB2, ROBINS-I
	Performance Adherence Bias - Nonadherence of Participants	ROB2, ROBINS-I
Type Classifier	<b>Attrition Bias</b>	CoB, Newcastle, QUIPS, ROB1, ROB2, ROBINS-I

Attrition Bias	Incomplete outcome data	MMAT, Newcastle, QUIPS, ROB1, ROB2, ROBINS-I
	Influence of outcome on missingness of data	Newcastle, ROB2
	Exclusions due to missing data on intervention	ROBINS-I
	Exclusions due to missing data on measured variables	ROBINS-I
	Imbalance in missing data	Newcastle, QUIPS, ROBINS-I
	Sensitivity to missing data	ROBINS-I
	Inadequate response rate	QUIPS
	Inadequate understanding of missing data	QUIPS
Type Classifier	<b>Detection Bias</b>	CoB, ROB1, ROB2, ROBINS-I, ROBIS
Detection Bias Relational Component	<b>Detection Bias for Attribute</b>	
	Detection bias related to reference standard	Cochrane ROB DTA
	Detection bias related to index test	Cochrane ROB DTA
Detection Bias Relational Component, Detection Bias for Attribute	Detection bias for outcome (bias in ascertainment of the attribute value that plays the role of outcome in the analysis)	Newcastle, PROBAST, QUIPS, ROB1, ROB2, ROBINS-I
	Detection bias for exposure (bias in ascertainment of the attribute value that plays the role of exposure in the analysis)	Newcastle, PROBAST, QUIPS, ROBINS-I
	Detection bias for confounder (bias in ascertainment of the attribute value that plays the role of confounder in the analysis)	ROBINS-I
Detection Bias Process Specification	Ascertainment bias	CoB, Newcastle
	Measurement bias	ROB2, ROBINS-I
	Classification bias (Misclassification bias)	CoB, Newcastle, QUADAS-2, ROBINS-I

Detection Bias	<b>Information Bias</b>	CoB
Detection Bias, Information Bias	<b>Definition Bias</b>	
	<b>Assessment Method Bias</b>	
	<b>Noncognitive Influence Bias</b>	
	<b>Cognitive Interpretive Bias</b>	ROB2, ROBINS-I
	<b>Availability Bias</b>	CoB
	Lack of blinding (eg blinding of outcome assessors)	MMAT, Newcastle, PROBAST, QUADAS-2, ROB1, ROB2, ROBINS-I
	Incorporation bias (eg non-independence of reference standard and index test, systematic errors in measurement of outcome related to intervention received)	Cochrane ROB DTA, ROBINS-I
Detection Bias, Information Bias, Definition Bias	Nonrepresentative definition/threshold	QUADAS-2
	Definition/threshold not prespecified	QUADAS-2, ROBINS-I, PROBAST
	Definition/threshold unclear	Newcastle, ROBINS-I
	Surrogate marker bias (Substitution game bias)	CoB
Detection Bias, Information Bias, Assessment Method Bias	Inappropriate method	MMAT, Newcastle, PROBAST, QUIPS, ROB2
	Insensitive measure bias	CoB
	Assessment method unclear	Newcastle, QUIPS
	Improper conduct of assessment	QUADAS-2
	<b>Incomplete application of assessment</b>	Cochrane ROB DTA, QUADAS-2
	Inadequate follow up period for outcome of interest	Newcastle
	Inappropriate delay between index test and reference standard	Cochrane ROB DTA, PROBAST, QUADAS-2
	Error in data collection not minimized	Newcastle, ROBIS
	Imbalance in application of method	Cochrane ROB DTA, Newcastle, PROBAST, QUIPS, ROB2, ROBINS-I

Detection Bias, Information Bias, Assessment Method Bias, Incomplete application of assessment	Partial reference bias	CoB
	Differential reference bias	CoB
	Verification bias	CoB
Detection Bias, Information Bias, Noncognitive Influence Bias	Classification potentially influenced by risk of outcome	ROBINS-I
	Diagnostic access bias	CoB
Detection Bias, Information Bias, Cognitive Interpretive Bias	Observer bias	CoB
	Recall bias	CoB
	Apprehension bias (Hawthorne effect)	CoB
	Diagnostic suspicion bias	CoB
	Hypothetical bias	CoB
	Mimicry bias	CoB
	Previous opinion bias	CoB
	Perception bias	CoB
	Unacceptability bias (Unacceptable disease bias)	CoB
Detection Bias, Information Bias, Availability Bias	Differential data availability during tests	PROBAST
Type Classifier	<b>Analysis Bias</b>	MMAT, PROBAST, QUIPS
Analysis Bias	<b>Bias Controlling for Confounding Factors</b>	MMAT, PROBAST, QUIPS
	Analysis model selection bias (Improper statistical model)	QUIPS
	Inadequate numbers for analysis	PROBAST
	<b>Bias in Handling of Data</b>	
	<b>Analysis Selection Bias</b>	
	<b>Analysis Bias in Predictive Model Development</b>	
	Data-dredging bias	CoB

	Lack of blinding of data analysts	CoB
	Wrong sample size bias	CoB
Analysis Bias, <b>Bias Controlling for Confounding Factors</b>	Bias controlling for confounding factors and time-varying confounding	ROBINS-I
	Adjustment for selection bias	ROBINS-I
	Inadequate adherence effect analysis	ROB2, ROBINS-I
	Predictors included in outcome definition	PROBAST
	Collider bias	CoB
	Immortal time bias	CoB
Analysis Bias, <b>Bias in Handling of Data</b>	Incomplete data analysis	PROBAST, QUADAS-2
	No accounting for uninterpretable results	Cochrane ROB DTA
	Inappropriate handling of missing data	PROBAST, QUIPS
	Inappropriate handling of variables	PROBAST, QUIPS
	Inappropriate handling of complexities in the data	PROBAST
	Differential handling of confounder measurement	QUIPS
	Handling of confounders unclear	QUIPS
	Inappropriate handling of missing confounder data	QUIPS
Analysis Bias, <b>Analysis Selection Bias</b>	Inadequate intention-to-treat analysis	COKA, ROB2
	Inadequate per-protocol analysis	ROB2
	Early trial termination	COKA
	Preliminary analysis	COKA
	<b>Analysis Threshold Selection Bias</b> (thresholds for statistical significance)	
	Analysis selection bias from availability bias (Availability Bias)	CoB

Analysis Bias, <b>Analysis Selection Bias, Analysis Threshold Selection Bias</b>	Absence of multiple comparison adjustment	Benjamini <sup>6</sup>
Analysis Bias, <b>Analysis Bias in Predictive Model Development</b>	Selection of predictors based on univariable analysis	PROBAST
	Inappropriate evaluation of model performance measures	PROBAST
	Model overfitting and optimism	PROBAST
	Final model not corresponding to multivariable analysis	PROBAST
Type Classifier	<b>Reporting Bias</b>	CoB, QUIPS, ROB1, ROB2, ROBINS-I, ROBIS
Reporting Bias	<b>Selective Analysis Reporting Bias</b>	
	<b>Interpretive Reporting Bias (Spin bias)</b>	CoB
	Publication bias	CoB
	Reported result not following pre-specified analysis plan	ROB2, ROBIS
	Inadequate reporting to assess analytic strategy	QUIPS
	No explanation of withdrawals	Cochrane ROB DTA
	Pre-final publication form	COKA
	Results emphasized based on statistical significance	ROBIS
	Relevance of studies to research question not appropriately considered	ROBIS
Reporting Bias, Selective Analysis Reporting Bias	<b>Selective Outcome Reporting (Outcome reporting bias)</b>	CoB, ROB1
	Subgroup analysis reporting bias	COKA, ROBINS-I
	Selective analysis reporting from availability bias	CoB
	Selective analysis reporting from repeated analyses at multiple times	ROB2, ROBINS-I
	Selective analysis reporting from multiple analytic models	Alper <sup>3,4</sup> and Peters <sup>5</sup>
	Selective analysis reporting from multiple thresholds (thresholds for variable definitions)	Leeflang <sup>21</sup>

Reporting Bias, Selective Outcome Reporting	Selective outcome measure reporting within outcome domain	ROB2, ROBINS-I
	Selective outcome measure reporting across outcome domains	QUIPS
Reporting Bias, Interpretive Reporting Bias	Interpretation of findings not addressing risk of bias	ROBIS
	Selective theory reporting (All's well literature bias)	CoB
	Biases of rhetoric	CoB
	Confirmation bias	CoB
	Hot stuff bias	CoB
	Novelty bias	CoB
	Positive results bias	CoB
Type Classifier	<b>Synthesis Bias</b>	ROBIS
Synthesis Bias	Synthesis missing eligible studies	ROBIS
	Study parameters not appropriate for synthesis	ROBIS
	Heterogeneity not addressed	ROBIS
	Sensitivity to factors	ROBIS
	Biases in studies influence synthesis	ROBIS
	<b>Synthesis Information Bias</b>	
Synthesis Bias, Synthesis Information Bias	Insufficient study characteristics available for proper results interpretation	ROBIS
	Incomplete collection of relevant study results for synthesis	ROBIS
	Methodologic quality assessment inadequate	ROBIS
	Error in risk of bias assessment not minimized	ROBIS
Type Classifier	<b>Conflicted Interests Bias</b>	
Conflicted Interests Bias	Funding bias (Industry sponsorship bias)	CoB

Qualitative Research Bias	Inappropriate qualitative approach	MMAT
	Inadequate qualitative data collection methods	MMAT
	Inappropriate qualitative analysis	MMAT
	Unsubstantiated interpretation of results	MMAT
	Incoherence between data, analysis and interpretation	MMAT
Mixed Methods Research Bias	Inadequate rationale for mixed methods design	MMAT
	Ineffective integration of study components	MMAT
	Inappropriate interpretation of integration of qualitative and quantitative findings	MMAT
	Inadequate handling of inconsistency	MMAT
Predictive Model Research Bias Relational Component	Bias in predictive model development	PROBAST
	Bias in predictive model validation	PROBAST
Predictive Model Research Bias	Absence of any validation	PROBAST
	Absence of any external validation	PROBAST

Abbreviations: CoB, Catalogue of Bias<sup>7</sup>; Cochrane ROB DTA, Cochrane risk of bias summary style for diagnostic test accuracy reviews<sup>8</sup>; COKA, COVID-19 Knowledge Accelerator<sup>9,10,11</sup>; MMAT, Mixed Methods assessment Tool<sup>12</sup>; Newcastle, Newcastle-Ottawa Scale for non-randomized studies<sup>13</sup>; PROBAST, Prediction Model Risk of Bias Assessment Tool<sup>14</sup>; QUADAS-2, Quality of Assessment of Diagnostic Accuracy Studies<sup>15</sup>; QUIPS, Quality in Prognosis Studies<sup>16</sup>; ROB1, Cochrane Collaboration's Risk of Bias tool<sup>17</sup>; ROB2, Revised Risk of Bias Tool<sup>18</sup>; ROBINS-I, Risk Of Bias In Non-randomised Studies – of Interventions<sup>19</sup>; ROBIS, Risk Of Bias In Systematic Reviews<sup>20</sup>

\*Concept name bolded if both a classifier (Category) and a codable concept (member of the concept list)

## Rating Categories

<b>Category</b>	<b>Concept Name (Alternative Terms)</b>	<b>Source</b>
Rating of Certainty	Low risk of false certainty	PROBAST, QUADAS-2, QUIPS, ROB1, ROB2, ROBINS-I, ROBIS
	Moderate risk of false certainty	QUIPS, ROBINS-I
	High risk of false certainty	PROBAST, QUADAS-2, QUIPS, ROB1, ROB2, ROBIS
	Serious risk of false certainty	ROBINS-I
	Critical risk of false certainty	ROBINS-I
	Some risk of false certainty	ROB2
	Risk of false certainty Unclear	PROBAST, QUADAS-2, ROB1, ROBIS
Rating of Factor Presence	Factor present	COKA, MMAT, Newcastle, PROBAST, QUADAS-2, ROB2, ROBINS-I, ROBIS
	Factor likely present	PROBAST, ROB2, ROBINS-I, ROBIS
	Factor likely absent	PROBAST, ROB2, ROBINS-I, ROBIS
	Factor absent	COKA, MMAT, Newcastle, PROBAST, QUADAS-2, ROB2, ROBINS-I, ROBIS
	No information	PROBAST, ROB2, ROBINS-I, ROBIS
	Factor presence or absence unclear	MMAT, QUADAS-2
Rating of Bias Direction	Risk of bias favoring experimental	ROB2, ROBINS-I
	Risk of bias favoring comparator	ROB2, ROBINS-I
	Risk of bias towards null	ROB2, ROBINS-I
	Risk of bias away from null	ROB2, ROBINS-I

	Risk of bias direction unpredictable	ROB2, ROBINS-I
Rating of Influence	Factor has potential to impact results	ROB2
	Factor likely has potential to impact results	ROB2
	Factor likely does not have potential to impact results	ROB2
	Factor does not have potential to impact results	ROB2

Abbreviations: CoB, Catalogue of Bias<sup>7</sup>; Cochrane ROB DTA, Cochrane risk of bias summary style for diagnostic test accuracy reviews<sup>8</sup>; COKA, COVID-19 Knowledge Accelerator<sup>9,10,11</sup>; MMAT, Mixed Methods assessment Tool<sup>12</sup>; Newcastle, Newcastle-Ottawa Scale for non-randomized studies<sup>13</sup>; PROBAST, Prediction Model Risk of Bias Assessment Tool<sup>14</sup>; QUADAS-2, Quality of Assessment of Diagnostic Accuracy Studies<sup>15</sup>; QUIPS, Quality in Prognosis Studies<sup>16</sup>; ROB1, Cochrane Collaboration's Risk of Bias tool<sup>17</sup>; ROB2, Revised Risk of Bias Tool<sup>18</sup>; ROBINS-I, Risk Of Bias In Non-randomised Studies – of Interventions<sup>19</sup>; ROBIS, Risk Of Bias In Systematic Reviews<sup>20</sup>

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