Viewpoint

Redundancy in Evidence Synthesis: Overlap, Waste, and Distortion in the Secondary Evidence Ecosystem

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Abstract

Systematic reviews and meta-analyses are cornerstones of evidence-based medicine, yet the proliferation of overlapping and redundant syntheses has become a critical meta-research concern: it wastes finite research resources, confuses clinicians and guideline developers, and particularly in tertiary syntheses such as overviews and umbrella reviews, risks distorting the perceived weight of clinical evidence through double-counting of primary data. Drawing on 3 decades of meta-epidemiological, methodological, and policy literature, and treating the COVID-19 pandemic as an illustrative extreme case, this Viewpoint proposes a 3D conceptual framework comprising production-side drivers, propagation-side distortions, and governance-side failures that integrates previously fragmented observations into a unified systems model. We argue that redundancy is best understood not as a failure of individual review teams but as a structural pathology of the evidence ecosystem, sustained by misaligned incentives and by feedback loops through which weak governance enables excess production whose downstream distortions further erode oversight. The framework explains why single-dimension interventions have limited effect and maps coordinated intervention levers to each stakeholder group: review methodologists and meta-researchers, journal editors and peer reviewers, registration platform operators, and research funders and policymakers. The framework also locates the boundary between warranted replication and wasteful duplication—a distinction that current overlap metrics quantify without judging. We propose that a synthesis be treated as justified when its authors can name the decision it would alter and the element of the question existing syntheses leave unresolved, and we indicate how that judgment could be applied prospectively. We further specify a technically concrete proposal for an AI-assisted evidence adequacy assessment system, combining semantic similarity modelling, PICO (population, intervention, comparison, outcome) entity extraction, and evidence gap quantification, with a 3-tier graded output and integration points at PROSPERO preregistration, journal editorial triage, and funder proposal screening; we emphasize that this system is a specification awaiting validation—not a deployable tool. Against this diagnosis, we assess 4 intervention strategies against feasibility, evidence, scalability, and unintended consequences, and identify mandated preregistration scoping combined with AI-assisted adequacy assessment as the most tractable near-term pairing. We state plainly what bounds the argument: the framework is a conceptual synthesis rather than a systematic synthesis, the quantitative estimates cited are illustrative rather than exhaustive and derive from studies with heterogeneous definitions and sampling frames, and the causal relationships posited among the 3 dimensions remain to be tested empirically. Consistent with our conclusion, we contend that reform should aim not at minimizing redundancy per se but at calibrating the evidence ecosystem, preserving the epistemically valuable function of independent replication while suppressing structural waste. Since production, propagation, and governance are linked as a system, durable change requires coordinated action across registries, journals, funders, and academic institutions rather than isolated reform by any single stakeholder.

(J Meta and Res Int 2026;1:e104150) doi: 10.2196/104150

KEYWORDS

evidence synthesis; systematic reviews; redundancy; meta-research; research waste; primary study overlap; artificial intelligence; evidence ecosystem; research integrity

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Introduction

Evidence synthesis underpins clinical decision-making, guideline development, and health policy [1]. Annual publication of systematic reviews rose by 2728% between 1991 and 2014 against 153% growth for all PubMed-indexed items, outpacing new randomized trials, while reporting remained heterogeneous [2,3]. The output has also outpaced growth in the primary evidence synthesized [4]. Expansion has brought a recognized structural problem: redundant and overlapping syntheses that duplicate effort, consume finite resources, and distort the perceived weight of clinical evidence [5,6]. Overlap is now the norm, since 67% of the meta-analyses published in 2010 had at least one overlapping meta-analysis on the same topic [7], with comparable patterns for network meta-analyses [8], genetic epidemiology [9], and COVID-19 treatments [10]. Such redundancy is avoidable waste [6] and a structural feature of a system that rewards output, irrespective of the epistemic need [2].

This Viewpoint focuses on clinical medicine and public health, where the stakes are the highest and the evidence infrastructure most developed. Our audience comprises review methodologists and meta-researchers studying research waste [1,11]; journal editors and peer reviewers adjudicating novelty claims, for which no standardized tool exists [12]; registration platform operators such as PROSPERO, whose duplicate-detection capacity remains limited [13,14]; and funders and policymakers allocating synthesis resources [15]. Rather than a systematic synthesis, we advance a theoretical argument: redundancy operates through 3 causally interconnected dimensions—production, propagation, and governance—and effective interventions must address all three.

The framework is rooted in systems thinking and moves beyond fragmented analyses that treat redundancy as one undifferentiated problem [11,16]. Production-side mechanisms address upstream drivers, explaining why overlapping reviews are initiated rather than treating duplication as a by-product of research growth [17-19]. Propagation-side mechanisms trace how redundancy distorts interpretation and imposes cumulative costs on resources and credibility [5,20,21]. Governance-side mechanisms identify institutional shortcomings that let redundant production persist [12,14,22], and framing these layers as one causal system distinguishes the model from prior accounts [23,24]. Three cross-cutting challenges complicate measurement and policy alike: replication versus wasteful duplication [25-27], fragile resource-waste estimates [6], and uncertain reproducibility of AI-assisted detection tools [28-30].

The argument advanced here is interpretive rather than empirical. We conducted no systematic search, and the quantitative estimates cited are drawn from published meta-research and were selected to illustrate the mechanisms described rather than to establish prevalence. Where we propose interventions, we assess them against stated criteria rather than report evaluated effects, indicating explicitly which claims rest on existing evidence and which remain to be tested.

A 3D Framework for Evidence Ecosystem Redundancy

The framework organizes redundancy into 3 interlocking dimensions: production-side drivers, propagation-side distortions, and governance-side failures. These map onto the lifecycle through which a redundant synthesis arises, exerts influence, and escapes correction [11,16] (Table 1). The layers have been studied separately: production through measurements of redundancy prevalence [17,18], propagation through quantification of overlap and currency [21,26,31], and governance through evaluations of registration and editorial policy [14,32]. They are conceptually distinct [2,12,14,21,27] yet causally interactive, because weak governance permits excess production whose distortions erode the credibility on which effective governance depends [5,33] and that are differentially actionable such that the production-side measures target funders, propagation-side measures target clinicians and guideline bodies, and governance-side measures target registries and journals [24,34]. Prior work has concentrated on production-side causes such as inadequate scoping [17,18], treating overlap metrics as reporting tools rather than ecosystem-level diagnostics [26,31,35].

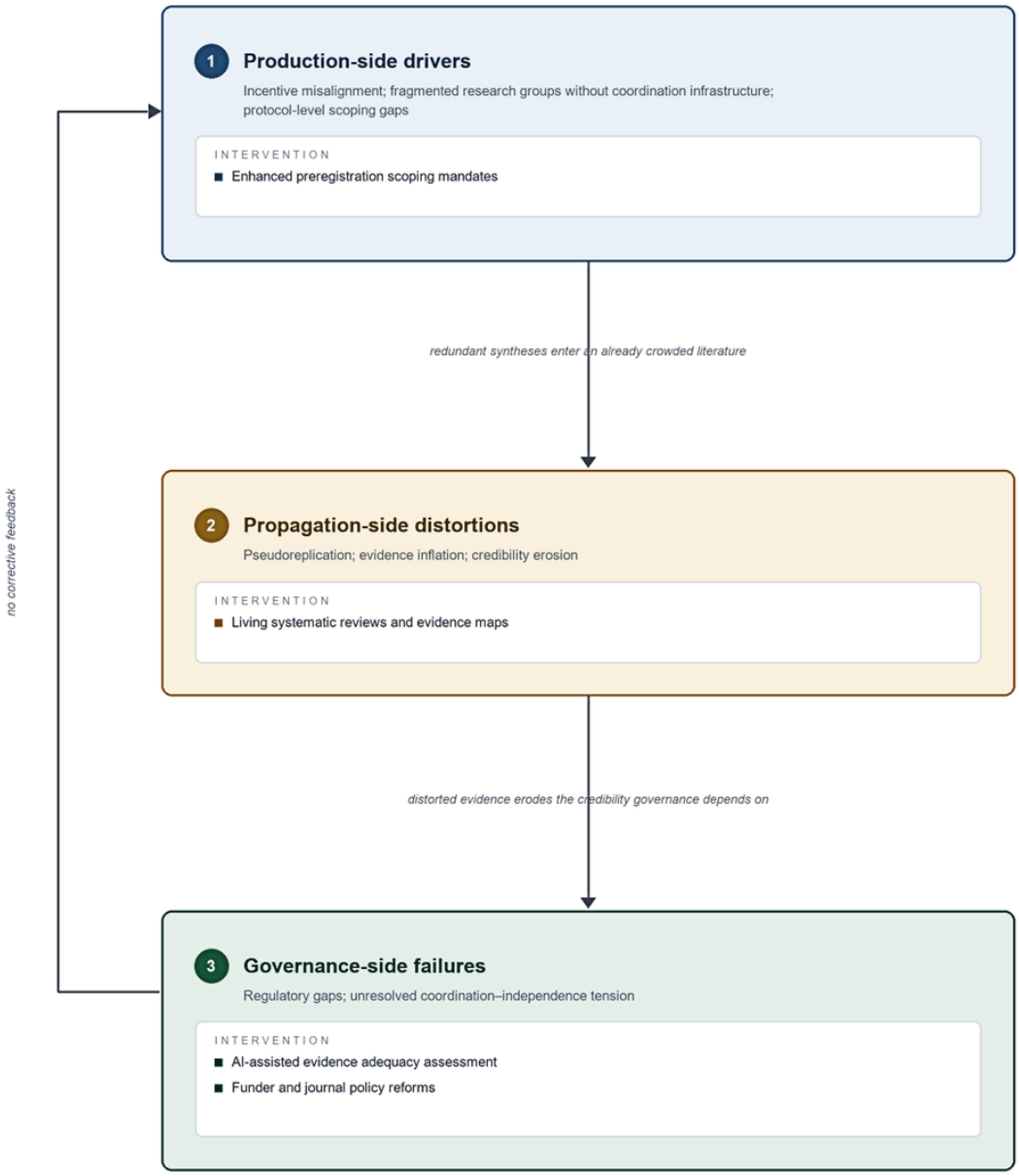
Table 1. 3D framework of evidence synthesis redundancy. This table sets out the 3 dimensions of the framework, the mechanisms proposed for each, and illustrative empirical findings on which each dimension rests. The findings were selected from the meta-epidemiological, methodological, and policy literature reviewed in this Viewpoint to illustrate the mechanisms described; they are illustrative rather than exhaustive. The underlying studies used heterogeneous designs and covered differing populations and settings, were drawn from a range of clinical and methodological domains rather than from a single disease area, and were published between 2013 and 2025; the percentages are therefore neither directly comparable nor pooled.

Dimension	Mechanisms	Key empirical findings
Production-side drivers	Incentive misalignment, fragmented research groups without coordination infrastructure, protocol-level scoping gaps	67% of the meta-analyses published in 2010 had at least one overlapping meta-analysis on the same topic [7]; 42% (95% CI 36%-48%) of new clinical studies were justified using a systematic review [17]; 138 of 1054 COVID-19 registrations were submitted after a similar protocol already existed [13].
Propagation-side distortions	Pseudoreplication, evidence inflation, credibility erosion	68% of the systematic reviews exhibit overlap, with up to 76 overlapping reviews on one topic [5]; median corrected covered area 4.0 across 60 overviews, of which only 32 reported overlap [31]; 45 reports of 38 systematic reviews of remdesivir within ~14 months, 51% out-of-date at publication [10].
Governance-side failures	Regulatory gaps, unresolved coordination-independence tension	Only 9% of the overlapping systematic reviews reported protocol registration [5]; 75.4% of published COVID-19 treatment reviews were unregistered [36]; PROSPERO publication delays hinder transparency [22].

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Figure 1 depicts these 3 dimensions as a reinforcing cycle and indicates where each intervention strategy acts. The framework is diagnostic and prescriptive: diagnostically, it identifies which dimension predominates in a given domain; and prescriptively, it implies that interventions be matched to the dimension they address and that reform requires coordinated action across all 3 levels [16,24]. This is consistent with evidence that single-lever interventions produce partial effects: registration yields modest quality gains [32], overviews have neglected overlap and currency [21,31], and reporting guidelines have improved transparency without constraining review numbers [37]. This figure is a conceptual schematic derived from the literature reviewed in this Viewpoint; because it is domain-general, it depicts no specific disease area, study population, setting, or time frame, and it presents no primary data. Its boxes and arrows denote proposed causal relationships rather than measured effects or effect sizes.

Figure 1. Reinforcing cycle of redundancy. The 3 dimensions of evidence ecosystem redundancy form a reinforcing cycle. Production-side drivers generate redundant syntheses, propagation-side distortions amplify their consequences, and governance-side failures sustain the conditions permitting both, with a feedback pathway indicating why the cycle does not self-correct. Each of the 4 intervention strategies assessed in this Viewpoint is shown at the dimension it is intended to interrupt: enhanced preregistration scoping mandates act on production-side drivers, living systematic reviews and evidence maps act on propagation-side distortions, and AI-assisted evidence adequacy assessment and funder and journal policy reform act on governance-side failures.



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Production-Side Drivers of Redundancy

Inadequate Scoping and Overlapping Research Questions

The proximal cause of redundant synthesis is the independent formulation of near-identical questions by multiple teams, often without adequate scoping of the existing evidence landscape. In a meta-analysis of 21 meta-research studies representing 3621 original studies and protocols, the proportion of new clinical studies justified using a systematic review ranged from 16% to 87%, with a pooled mean of only 42% (95% CI 36%-48%) [17]; a systematic examination of randomized controlled trials likewise found that most reports did not cite prior research relevant to the trial question [38]. Justification using existing reviews therefore remains inconsistent [17], even though the evidence-based research approach is widely endorsed in principle [19,39].

The PICO (population, intervention, comparison, and outcome) framework, while essential for defining precise questions, can mask substantial overlap: teams addressing what they believe to be distinct questions may investigate nearly identical populations and interventions, and because overlap is conventionally assessed element by element rather than at the level of the question, partial congruence goes unrecognized. Among overlapping network meta-analyses, a median of 73% of nodes, 79% of treatments, and 48% of references were shared between index and overlapping analyses [8]. Lund and colleagues [18] identify the lack of systematic evaluation of existing evidence as a primary contributor to redundancy in health research. This structural gap concerns the absence of mandated pre–protocol scoping requirements rather than any claim that no scoping occurs: many researchers establish the scope of the research, but without a standard requirement, quality is variable and unenforceable.

PROSPERO Registration and Duplicate Detection

PROSPERO was established to enhance transparency and reduce unintended duplication by requiring the deposit of a protocol before work begins [14]. Registrations rose 10-fold from 63 per month in 2012 to about 800 per month in 2017, exceeding 26,500 records [14], and prospectively registered reviews achieved higher AMSTAR (A Measurement Tool to Assess Systematic Reviews), R-AMSTAR (revised AMSTAR), and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) scores than nonregistered reviews [32]. At least 5 registration options now exist, including INPLASY (International Platform of Registered Systematic Review and Meta-analysis Protocols) and the Open Science Framework [40]. Its limitations as a duplication-prevention mechanism, however, are structural rather than incidental.

Beresford and colleagues [13] found substantial duplication among PROSPERO registrations during the COVID-19 pandemic. Of 1054 COVID-19 registrations submitted between March 2020 and January 2021, 138 were submitted when a protocol with a similar PICOS (population, intervention, comparison, outcome, and study design) was already registered; duplication was most pronounced for treatment reviews, with 14 separate registrations addressing hydroxychloroquine efficacy [13]. Surveyed authors mostly reported having identified similar reviews when searching PROSPERO beforehand, citing differences in PICOS or planned analyses, poor quality of previous registrations, and the need to update evidence [13]. The platform relies on manual, user-initiated searching; its newer overlap-flagging features remain author-assessed rather than semantically automated, and detection occurs at registration rather than at topic selection. The mechanism is therefore reactive rather than preventive, compounded by the fact that registration remains far from universal [36].

Academic Incentives and Fragmented Production

The persistent production of redundant syntheses cannot be explained by methodological lapses alone. Incentive structures rewarding publication volume, journal prestige, and citation counts favor output irrespective of genuine knowledge gaps [1,2], and competition for positions and grants privileges productivity metrics over epistemic value [41]. Systematic reviews suit this environment: they need no primary data collection, fit doctoral or grant cycles, and are well cited [2,42]; many function primarily as easily produced publishable units, a type readily serving sponsors' marketing interests [2]. The result is overproduction on popular topics, misaligning synthesis effort with evidence need [15]. Thousands of research groups, guideline bodies, and funders operate with varying awareness of the evidence landscape, and no central mechanism prioritizes topics or redirects resources from saturated questions [3]. Ravaud and colleagues [16] diagnosed this as a core pathology, proposing a transition from a decentralized, investigator-driven model to a coordinated evidence ecosystem.

The COVID-19 Pandemic as Extreme Case

The COVID-19 pandemic compressed and amplified these dynamics, serving as a natural experiment [43]. The acute demand and rapid accumulation of primary studies pushed review production beyond both the rate of new primary evidence and the ecosystem's absorptive capacity. The acceleration came with a measurable decline in rigor: a review of 686 COVID-19 clinical articles found substantially shorter times to acceptance (median 13 days versus 110 days for historical controls) and lower methodological quality across all study designs [44]. The evidence base was correspondingly unstable, and Brubacher and colleagues [33] found that proliferating overlapping syntheses created confusion among decision-makers about which evidence to trust; this episode is better characterized as a systemic failure of the evidence pipeline than as a succession of individual errors [43].

Review output had already grown steeply before the pandemic, exceeding the annual output of randomized trials by 2017 [4]. During the pandemic, this trajectory steepened while the evidence base remained thin and rapidly changing. In one case study, 38 systematic reviews of remdesivir, a new publication every 9 days, appeared within roughly 14 months; 51% were out-of-date at publication and only 21% had been registered in PROSPERO [10]. A parallel analysis of 346 reviews of COVID-19 treatments found that 75.4% had not been registered at all and that only 29.7% of the registered protocols had been published after at least 17 months [36]. The pandemic thus

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exposed rather than created a structural vulnerability: where a living product was maintained instead, the same question was addressed with a fraction of the effort, with living guidelines updating within 14 days [45,46].

Propagation-Side Distortions

Primary Study Overlap and Pseudoreplication

Production-side redundancy concerns duplicated review questions; execution-level overlap concerns repeated inclusion of the same primary studies across multiple reviews on the same topic [27]. Question-level duplication wastes effort before any results exist and is preventable at registration. Primary study overlap becomes visible only once reviews are published, and its principal statistical consequence is the inflation of apparent sample size and event count, overstating the precision of pooled estimates [27]. Overlap is not in itself bias: it may reflect legitimate differences in question framing and can be a diagnostic asset as much as a hazard [26]—the problem arising when such overlap is substantial and unacknowledged [27].

The primary metric for quantifying overlap is the corrected covered area (CCA): 0% to 5% indicates slight overlap, 6% to 10% moderate, 11% to 15% high, and greater than 15% very high [31]. In the original validation study of 60 overviews, only 32 reported overlap at all and the median CCA was 4.0 [31]. Ou and colleagues [5] confirmed across 11 quantitative studies that 68% of the systematic reviews exhibit overlap, with as many as 76 overlapping reviews on a single topic, and that only 36% referenced previous reviews on the same question. Overlap has since been documented across oncology, cardiovascular medicine, genetic epidemiology, and COVID-19 research [8,9,47]: only 12 of 38 index meta-analyses in genetic epidemiology were unambiguously unique, with a mean of 2.6 duplicates per index analysis [9], and multiple cardiovascular oncology reviews of the same drug-class associations showed significant overlap in included primary studies [47]. Clinicians and guideline developers may therefore encounter summaries that appear independent but derive from largely the same data.

Evidence Distortion: Scope and Mechanisms

Execution-level overlap distorts the perceived weight of clinical evidence. When the same primary studies contribute effect estimates to multiple meta-analyses, apparent consistency across syntheses is often read as replication and robustness, when it frequently reflects shared data rather than independent corroboration [27]. Two caveats are essential. First, this applies specifically to tertiary syntheses such as overviews and umbrella reviews, in which overlapping reviews are themselves pooled; for stand-alone reviews, the primary harms are research waste, confusing guidance, and inefficient resource allocation rather than statistical distortion per se [26,27]. Second, the phenomenon is not confined to overlap between reviews: covert duplicate publication of primary data has repeatedly been shown to inflate meta-analytic effect estimates—the classic case of ondansetron demonstrating that duplicated trial reports can materially change pooled results [48].

Guideline panels are particularly vulnerable when they base recommendations on the number of supporting meta-analyses rather than on independent primary studies. In a cross-sectional survey of 684 health care decision-makers, 97.9% reported regularly or occasionally encountering more than one systematic review on a topic of interest and 50.8% reported difficulty identifying the most trustworthy synthesis, with difficulties relating to lack of time (55.2%), varying methodological quality (54.2%), differences in results and conclusions (49.7%), and variation in included studies (44.6%) [20]. Most respondents compared reviews on relevance, quality, and recency of search, and 87% expressed willingness to use an AI-assisted appraisal tool [20]. A perceptual pathway also operates regardless of pooling: multiple reviews on one topic create an impression of evidential richness that may not correspond to genuine depth [5,35].

Resource Waste and Credibility Erosion

The resource implications are substantial: a single systematic review typically requires hundreds of person-hours from protocol development through publication, and duplication of this effort sits within a broader pattern of avoidable waste in the production and reporting of research evidence [6]. Global estimates of the resulting waste nonetheless remain methodologically fragile, resting on extrapolations from small cost-per-review samples and untested counterfactual assumptions; 3 decades after the first formal articulation of avoidable waste, the problem remains unresolved rather than diminishing [6], and the framing has since been extended beyond medicine [49]. A less tangible but arguably more consequential harm is the erosion of trust in systematic reviews as a method [2,50]: conflicting reviews on one topic invite the inference that the methodology is unreliable, even when discordance arises from overlapping but nonidentical inclusion criteria [5,20].

The Boundary Problem: Replication Versus Duplication

A conceptual challenge intersects all propagation-side concerns: distinguishing legitimate redundancy from wasteful duplication. Some redundancy serves epistemic functions, including methodological triangulation, temporal updating, and contextual adaptation; replication in this sense is a deliberate, design-driven activity whose value depends on what it is intended to establish rather than mere repetition [25]. In practice, these distinctions are hard to operationalize. Rombey and colleagues [51] examined 100 non-Cochrane updates of systematic reviews, published a median of 5 years after the previous version; only half used the term update in the title, none reported using an existing decision tool, and less than one-third changed their conclusion [51]. Currency is more generally neglected: among 147 overviews, only about 1 in 4 considered whether included reviews were up-to-date [21]. CCA captures quantitative overlap but cannot assess the epistemic contribution of a new synthesis [26,31]. The evidence-based research approach provides a principled basis for such judgments [19,39] but has not been operationalized into prospectively applicable criteria, and no normative consensus on acceptable redundancy levels exists.

Because no threshold distinguishes productive from wasteful redundancy quantitatively, the operational question is not how much overlap exists but whether the proposed synthesis could change a decision that the existing evidence base cannot

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support—by incorporating new primary studies, by addressing a different PICO, or by applying a different analytical method. A new review is justified when its authors can name the decision it would alter and the element of the question that existing syntheses leave unresolved [26,31,35]. Making the criterion explicit also assigns responsibility clearly: investigators would state which decision the synthesis is intended to inform and which element of the question remains unresolved, while reviewers, editors, and funders would adjudicate that claim instead of inferring novelty from its absence.

Governance-Side Failures

Registration and Reporting Gaps

Current governance mechanisms for preventing redundant synthesis are fragmented and inconsistently enforced. Prospective registration, the primary existing safeguard, suffers from incomplete coverage, delayed publication, and reliance on manual overlap checking [22,36]: three-quarters of published COVID-19 treatment reviews were never registered [36], and quality gains are real but modest [32]. Reporting guidelines compound the problem: PRISMA 2020 specifies how a completed review should be reported but does not require authors to demonstrate that their synthesis addresses an unmet evidence need [37], and the PRIOR statement likewise addresses reporting quality rather than necessity [52]. Kolaski and colleagues [12] articulated principles of good scholarship requiring authors to situate their work within the existing evidence base and justify its contribution, though these remain honored more in the breach. The burden of determining novelty therefore falls on investigators, reviewers, and editors, none of whom have systematic tools for assessing duplication risk, and editorial policies vary widely [3,12].

Absence of Coordination Infrastructure

There is no central mechanism that coordinates synthesis production, prioritizes topics according to evidence needs, or redirects resources from saturated questions. The Future of Evidence Ecosystem series identified this gap and proposed a transition to coordinated, continuously updated synthesis infrastructure oriented to user needs [16,23], and Akl and colleagues [24] proposed Evidence Synthesis 2.0, integrating systematic, scoping, rapid, living, and overview reviews into a coordinated workflow. The COVID-END (COVID-19 Evidence Network to Support Decision-Making) demonstrated both the feasibility of coordination, through shared priority-setting, joint evidence mapping, and collaborative production across more than 50 partner organizations and the difficulty of sustaining it without permanent infrastructure and funding [53]. Frameworks for setting health research priorities have been available for more than a decade, with explicit recommendations that value and waste be assessed [15]; what is missing is not method but mandate.

Incentive Misalignment at Institutional Level

Governance failures extend to the institutional level. Promotion criteria reward publication volume and citation metrics rather than synthesis quality, coordination, or ecosystem stewardship [1,2], and grant review typically evaluates the intrinsic merit of individual proposals without assessing whether the proposed synthesis duplicates existing work [34]. Hayden and colleagues [34] argued for collaborative systematic review as a model achieving efficiency gains while preserving investigator autonomy, but such models need institutional support that remains underdeveloped [19,39]. The cumulative effect is an ecosystem without feedback: redundant production carries no penalty, and nothing self-corrects. The CCA was proposed in 2014; yet, 10 years later, 68% of the reviews still exhibited overlap and only 9% reported protocol registration [5,31]. The interventions discussed next are therefore evaluated not only on merit but on whether they introduce a feedback signal the system lacks.

Intervention Strategies

The interventions that follow are evaluated against 4 criteria: feasibility within current technical and institutional frameworks; empirical support for effectiveness; scalability across the full scope of clinical evidence synthesis; and unintended consequences, notably the risk of inhibiting valid replication or generating novel biases. Each criterion is applied using the evidence reviewed above rather than by assertion, and because the dimensions interact, the most effective strategies are those anticipated to influence several concurrently. These are proposals for the field to test rather than validated remedies: the literature reports associations, for example, between registration and review quality, rather than the causal effects that would justify a mandate [32,51].

Enhanced Preregistration Scoping Mandates

Mandating systematic scoping searches as a condition of PROSPERO registration and journal submission is the most immediately actionable intervention, combining high feasibility, a moderate evidence base, high scalability, and moderate risk. Authors would document a systematic search for existing reviews and provide explicit novelty justification referenced to defined PICO elements before registration [19,39]. PROSPERO could require a scoping search and a novelty statement as a condition of registration, and journals could require evidence of preregistration scoping at submission. The PRIOR (Preferred Reporting Items for Overviews of Reviews) statement shows that reporting standards can be extended to a new review type when the field identifies a need [52], and Xu and colleagues [54] found that formal protocol development, including systematic scoping, measurably improves review quality, consistent with the association between registration and higher AMSTAR scores [32]. The main risk is perfunctory searches meeting the formal requirement without genuine assessment [13]; enforcement would require editorial oversight and automated cross-validation against registry content.

AI-Assisted Evidence Adequacy Assessment

The most promising technological intervention is an automated system for detecting whether a proposed review topic already has an adequate evidence base, combining moderate feasibility, an emerging evidence base, high scalability, and significant risk. Machine learning has been applied across screening, data extraction, and risk-of-bias assessment, with screening the most mature [28]; reviews of AI-based tools report varying success

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and a consistent need for extensive human validation [29]. Existing tools address the downstream stages of review production; none addresses whether a review should be undertaken at all.

Technical Architecture

The system would combine 3 components. Semantic similarity modelling using dense vector embeddings would identify conceptually overlapping protocols and published reviews, going beyond keyword matching to capture PICO-level similarity, made tractable at registry scale by sentence-level embedding architectures [55]. PICO entity extraction using fine-tuned models would parse population, intervention, comparator, and outcome elements from abstracts and protocols, enabling structured rather than global overlap assessment, for which annotated corpora already exist [56]. Evidence gap quantification would map the proposed question against existing reviews, trial registries, and prior gap-mapping work to estimate whether the evidence base is saturated, partial, or absent [57,58]. Output would be graded rather than binary, ranging from a high-overlap warning where near-identical reviews exist to a no-adequate-evidence-base designation. Deployment would occur at PROSPERO preregistration screening, journal editorial triage, and funder proposal review.

Validation Challenges

Significant methodological work remains before responsible deployment. Current tools perform promisingly on curated benchmarks but have not been validated across the heterogeneous landscape of clinical research questions, where terminology variation and reporting differences degrade performance [29]. Performance is sensitive to the embedding model and training corpus, which are domain-specific and not interchangeable [55,56], and reproducibility is a further concern, since model behavior depends on training data, architecture, and preprocessing choices that are often incompletely reported [30]. Evidence-gap identification faces the same difficulty, with heterogeneous, unstandardized approaches and no agreed reporting conventions [57]. Domain-specific validation frameworks, including benchmark datasets reflecting clinical research diversity and reporting standards enabling independent verification, are therefore a prerequisite rather than a refinement.

Living Systematic Reviews and Evidence Maps

Living systematic reviews (LSRs), continuously maintained and periodically updated syntheses, shift from discrete one-off reviews to sustained evidence resources, combining moderate feasibility, a moderate evidence base, low-to-moderate scalability, and low risk [45,59]. Where a living review is maintained, the case for additional de novo reviews is substantially weakened, and updating becomes the default response to new evidence rather than a justification for a new publication [46]. COVID-19 supports this: living guidelines incorporated new trial results within 14 days whereas reviews of the same drug published over the same period were frequently obsolete at publication [10]. Evidence maps complement this by characterizing available evidence across broad topics to guide prioritization and identify saturation [58,60]. The barrier is sustainability: LSRs need ongoing funding and institutional buy-in absent from a model awarding funding to discrete projects. The original articulation assumed a continual approach could be sustained with feasible resources [45], but this remains unproven at scale, and sustaining a living review on a saturated question merely perpetuates attention on it [21]. Scaling LSRs would require fundamental restructuring of synthesis funding and the coordination infrastructure the ecosystem lacks [24,53].

Funder and Journal Policy Reforms

The most transformative but most challenging interventions operate at policy level: funder mandates requiring evidence needs assessments before funding new reviews, journal policies requiring explicit novelty justification with systematic scoping evidence, and promotion criteria rewarding synthesis quality and coordination over publication volume [1,24,34]. These combine low-to-moderate feasibility, a limited evidence base, high scalability, and significant risk. The fundamental tension is between coordination and the epistemic value of independent replication: multiple syntheses can serve a validation function when primary evidence is uncertain, and overlap frequently reflects different questions legitimately addressed to the same literature [25,26]. Policy interventions that suppress redundancy therefore risk suppressing the replication that makes evidence synthesis epistemically robust. The record is cautionary: the research-waste agenda has been articulated since 2009 [6,15], yet measured redundancy has not visibly declined [5]. Policy reform is therefore most likely to succeed when bundled with measurement and validation work rather than as a stand-alone mandate.

Priority Ranking

The highest-impact near-term intervention is the combination of enhanced preregistration scoping mandates and AI-assisted overlap detection because together they address the production and governance dimensions with moderate complexity and strong scalability and because demand for decision support is documented [20]. Preregistration mandates are feasible immediately, since registry infrastructure and reporting templates exist; AI-assisted detection is scalable in principle but requires validation first [29,30]. Living reviews and policy reform are longer-term structural changes requiring substantial institutional investment, their benefit conditional on stable funding and coordination the system does not supply [24,53]. Two considerations temper this ranking: no intervention has been evaluated in a controlled trial, so the ranking reflects strength of reasoning rather than demonstrated effect; and the interventions are not independent, since scoping mandates without detection are unenforceable at scale, while detection without a mandate produces no behavioral change.

Implications and Future Directions

For methodologists and meta-researchers, 3 priorities follow. The first is to develop and validate operational criteria for distinguishing warranted replication from wasteful duplication, applicable prospectively at registration and submission; existing overlap metrics quantify redundancy without judging its epistemic value [26,35], and the conceptual foundations for such criteria are recent [25]. The second is to generate transparently parameterized cost estimates across diverse

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settings and review types, since current estimates rely on heterogeneous definitions and untested counterfactuals [6]. The third is to establish validation frameworks for AI-assisted tools permitting independent reproduction [29,30].

For journal editors and peer reviewers, the immediate steps are procedural rather than technological. Submitted reviews should be required to contain explicit scoping of existing systematic reviews on the same topic, a structured statement of how the submission differs from prior work, and prospective registration in PROSPERO or an equivalent platform, each requiring documented association between protocol development, registration, and review quality [32,36]. The reporting infrastructure already provides the apparatus, since PRISMA 2020 structures reporting and PRIOR demonstrates that standards can be extended to a new review type [37,52]. AI-assisted triage tools, once validated, could flag high-overlap manuscripts but should augment rather than replace editorial judgment [28,29].

For registration platform operators, 3 priorities follow. Automated semantic similarity detection between submitted and existing protocols would replace reliance on author self-assessment, since most authors who registered a duplicate COVID-19 question had searched PROSPERO and nonetheless proceeded [13]. Real-time publication of registration records would close the windows during which duplicate protocols proliferate undetected [22]. Interoperability standards for cross-registry overlap detection are increasingly necessary [40]. PROSPERO's overlap-flagging feature is a positive first step but should be enhanced algorithmically and evaluated against documented overlap rates [5,13].

For research funders and policymakers, incorporating evidence adequacy assessments into grant review would address production-side drivers directly, requiring applicants to demonstrate that proposed syntheses address genuine gaps; the evidence-based research approach provides the conceptual basis and the James Lind Alliance a working model of coordinated priority-setting [19,39]. Pilot programs funding coordinated synthesis infrastructure, including living reviews and evidence maps, would test the feasibility of ecosystem-level coordination below the scale of national reform [53,58] and should be evaluated against explicit process measures: the rate of documented scoping searches, the proportion of funded reviews proceeding despite high measured overlap, and the currency of resulting syntheses [10,36]. Aligning incentives with ecosystem health rather than individual publication metrics cannot be achieved by any single stakeholder acting alone.

The evidence base on which this argument rests has 3 features that bound its claims. Grounded in systems thinking rather than a synthesis of quantitative data, this Viewpoint offers conceptual integration without empirical measurement of the relationships it posits, and the suggested causal relationships among the 3 dimensions remain to be validated through simulation modelling and longitudinal meta-epidemiological studies. The statistics cited are illustrative, drawn from studies employing diverse operational definitions and sampling frames, and should not be read as exact prevalence rates; the heterogeneity of reported overlap estimates reinforces the need for standardized measurement [5,26,31]. The AI-assisted assessment system is a theoretical construct without empirical validation, and the machine-learning literature on which it draws relies on self-reported performance and inconsistent reporting of model design [29,30]. We caution against its premature application until benchmarking and reproducibility standards are established.

Looking forward, 3 priorities follow. First, the boundary between justified replication and unnecessary duplication must be delineated through prospectively applicable criteria rather than retrospective evaluation, differentiating methodological triangulation, contextual adaptation, and systematic updating from unproductive repetition [25,26]; existing metrics establish how much overlap exists without indicating whether it is justified [31,35], and most overlapping reviews neither reference prior work nor report registration, suggesting much overlap is unconsidered rather than deliberate [5]. Second, transparent cost estimates for redundant synthesis are needed, separating direct production from downstream costs and stating assumptions explicitly [6]. Third, formal validation and reporting standards for AI-assisted redundancy detection are essential, requiring shared benchmark datasets and standardized performance metrics, because methodological work on evidence-gap identification remains heterogeneous with no agreed reporting conventions [57] and the models underlying existing tools are inconsistently described [29,30]. Without such validation, AI tools risk amplifying existing biases.

The COVID-19 pandemic served as a severe, unplanned stress test, showing how rapidly saturation can occur when demand surges and oversight is insufficient. Systematic reviews of a single drug appeared every 9 days, half obsolete at publication, and fewer than a quarter registered in advance [10]; three-quarters of published treatment reviews were unregistered [36]; and clinical studies were accepted in a fraction of the usual time at lower methodological quality than historical controls [44]. Although the pandemic prompted incremental reforms such as improved registry overlap detection, their durability remains uncertain, and future surges will test whether the system has become self-correcting or remains a fragile construct patched with temporary fixes [43,53].

Conclusion

This Viewpoint argues that redundancy in evidence synthesis is neither an incidental by-product of research growth nor a failure of individual review teams but a structural pathology of the evidence ecosystem, generated by production-side incentives, amplified by propagation-side distortions, and perpetuated by governance-side failures. The empirical basis is substantial: review output has grown far faster than the primary literature it synthesizes [2,4], most topics attract multiple overlapping syntheses [5,7,8], and overlapping reviews frequently go unacknowledged and unregistered [5,31]. The framework reframes redundancy from a problem of conduct to a problem of system design, since interventions targeting behavior while leaving the incentive and oversight architecture intact address symptoms rather than causes. Its principal contribution is diagnostic reorientation: specifying where redundancy originates, how its harms propagate, and why

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existing safeguards lack the feedback mechanisms necessary for self-correction [16,24].

Two conclusions follow. First, because the feedback loops linking production, propagation, and governance mean that isolated reforms are absorbed by existing dynamics, redundancy cannot be eliminated by any single stakeholder acting alone; coordinated intervention spanning registries, journals, funders, and academic institutions is necessary, and the partial effects of registration illustrate the limits of single-lever reform [22,32]. Second, the goal of reform should be not the minimization of redundancy as such but the optimization of the replication-duplication balance. Some redundancy is epistemically productive, since independent replication, temporal updating, and contextual adaptation confer robustness on synthesized evidence [25], and a system that suppressed all duplication would purchase efficiency at the cost of the self-correcting capacity that makes evidence synthesis credible. The task is therefore not waste elimination but ecosystem calibration [15,57]. That calibration requires measurement the field does not yet possess, governance mechanisms that currently lack enforcement, and willingness to treat the distribution of synthesis effort as a collective resource problem rather than an aggregation of individual publication decisions. Unrecognized redundancy, duplicated data, and misleading consensus undermine the credibility of evidence synthesis from within, and they do so most damagingly precisely when synthesized evidence is the most needed [2,5].

Funding

The authors declared no financial support was received for this work.

Data Availability

Data sharing is not applicable to this article as no datasets were generated or analyzed during this study.

Generative AI Use

The authors declare the use of generative AI (GenAI) in the research and writing process. According to the GAIDeT taxonomy (2025), the following tasks were delegated to GenAI tools under full human supervision: proofreading and editing, translation, and reformatting. The GenAI tool used was ChatGPT-4. Responsibility for the final manuscript lies entirely with the authors. GenAI tools are not listed as authors and do not bear responsibility for the final outcomes. Declaration submitted by author CC.

Authors' Contributions

All authors contributed to conceptualization, drafting, and critical revision of this Viewpoint, and all authors approved the final version.

Conflicts of Interest

None declared.

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Abbreviations

AMSTAR: A Measurement Tool to Assess Systematic Reviews
CCA: corrected covered area
COVID-END: COVID-19 Evidence Network to Support Decision-Making
INPLASY: International Platform of Registered Systematic Review and Meta-analysis Protocols
LSR: living systematic review
PICO: population, intervention, comparison, and outcome
PICOS: population, intervention, comparison, outcome, and study design
PRIOR: Preferred Reporting Items for Overviews of Reviews
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
R-AMSTAR: revised AMSTAR

Edited by S Brini; submitted 09.Jun.2026; peer-reviewed by D Pieper, N Smallheiser, N Neuendorf; comments to author 17.Jul.2026; revised version received 26.Sep.2026; accepted 02.Oct.2026; published 02.Nov.2026

Please cite as:
Chengxun C, Yao J, Zhou Y
Redundancy in Evidence Synthesis: Overlap, Waste, and Distortion in the Secondary Evidence Ecosystem
J Meta and Res Int 2026;1:e104150
URL: https://metascience.jmir.org/2026/1/e104150
doi: 10.2196/104150
PMID:

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