

Study Question

Are systematic reviews in environmental health more transparent and reproducible than non-systematic reviews?

Methods

- Identified reviews through systematic literature searches conducted during 3 Navigation Guide case studies:
 - Multiple Airborne Pollutant Exposure and Autism Spectrum Disorder (ASD)
 - Developmental Polybrominated Diphenyl Ether (PBDE) Exposure and Intelligence Quotient (IQ) / Attention Deficit Hyperactivity Disorder (ADHD)
 - Formaldehyde Exposure and Asthma (limited selection to studies published between 2011 – 2017 due to large body of literature)
- Compared each review to 9 domains of the Literature Review Appraisal Toolkit (LRAT), a structured appraisal of the methodological strengths and weaknesses of a review of evidence (Figure 1)
- Evaluated each review to determine if a self-identified systematic review
- Compared each review's conclusion to determine if broadly consistent with conclusion of associated Navigation Guide case study (Figure 4)

Background

Health Affairs
 content.healthaffairs.org
 doi: 10.1377/hlthaff.2010.1219
 (Health Aff) May 2011 vol. 30 no. 5 931-937
 An Evidence-Based Medicine Methodology
 To Bridge The Gap Between Clinical And
 Environmental Health Sciences
 Tracey J. Woodruff¹, Patrice Sutton² and The Navigation Guide Work Group³



2012: Publication of NTP Office of Health Assessment and Translation (OHAT) systematic review methodology

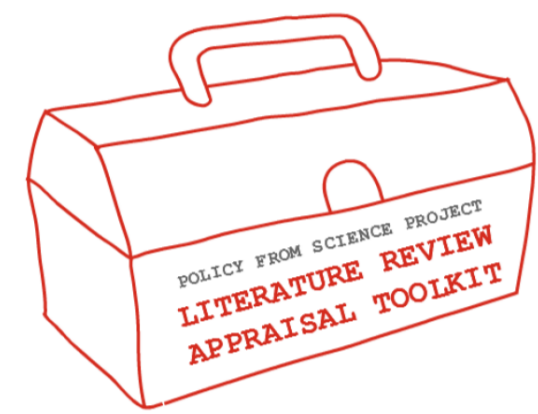
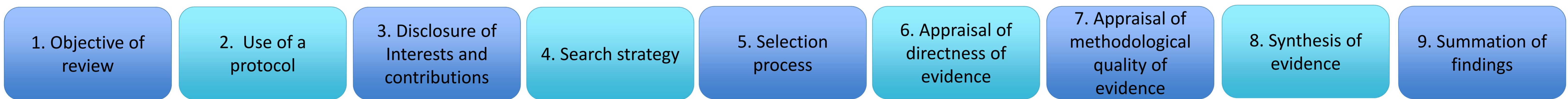
2011: Publication of Navigation Guide systematic review methodology for environmental health



2017: The National Academy of Sciences, Engineering, and Medicine (NAS), states, "Systematic reviews can be an important component in investigating evidence on low-dose adverse effects, and EPA can build on existing systematic reviews that are published in peer-reviewed literature."

The Literature Review Appraisal Toolkit (LRAT)

Figure 1. Literature Review Appraisal Toolkit Domains



LRAT Appraisal Rating Guide:

Satisfactory: conducted according to a clear, valid, and consistent procedure

Unclear: insufficient documentation to allow evaluation

Unsatisfactory: positive evidence of invalid or inconsistent procedure

<http://policyfromscience.com/lrat/>

Results

- We retrieved a total of 30 reviews eligible for the LRAT appraisal (Figure 2).
- Conclusions presented in reviews were consistent with those from the Navigation Guide reviews for 5/10 systematic reviews (50%) and 11/17 non-systematic reviews (65%) (Figure 3).
- Self-identified systematic reviews (SR) overall across all 3 case studies were rated with more satisfactory ratings than non-systematic reviews (NSR) (Figure 4d).

Figure 2: Number of Eligible Reviews Identified and Included in LRAT Appraisal

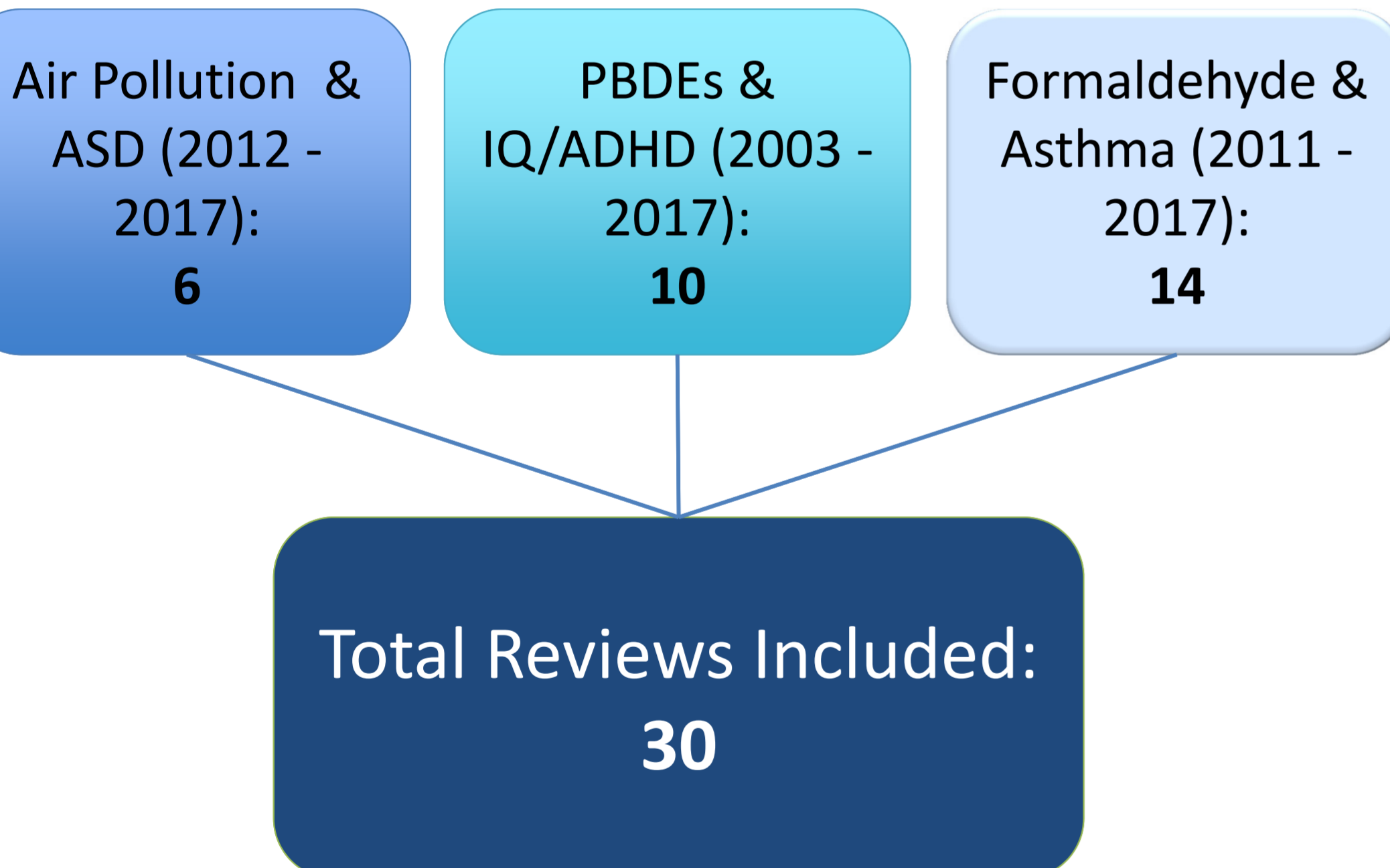


Figure 3: Conclusions Broadly Consistent with Navigation Guide Reviews, between SR vs NSR

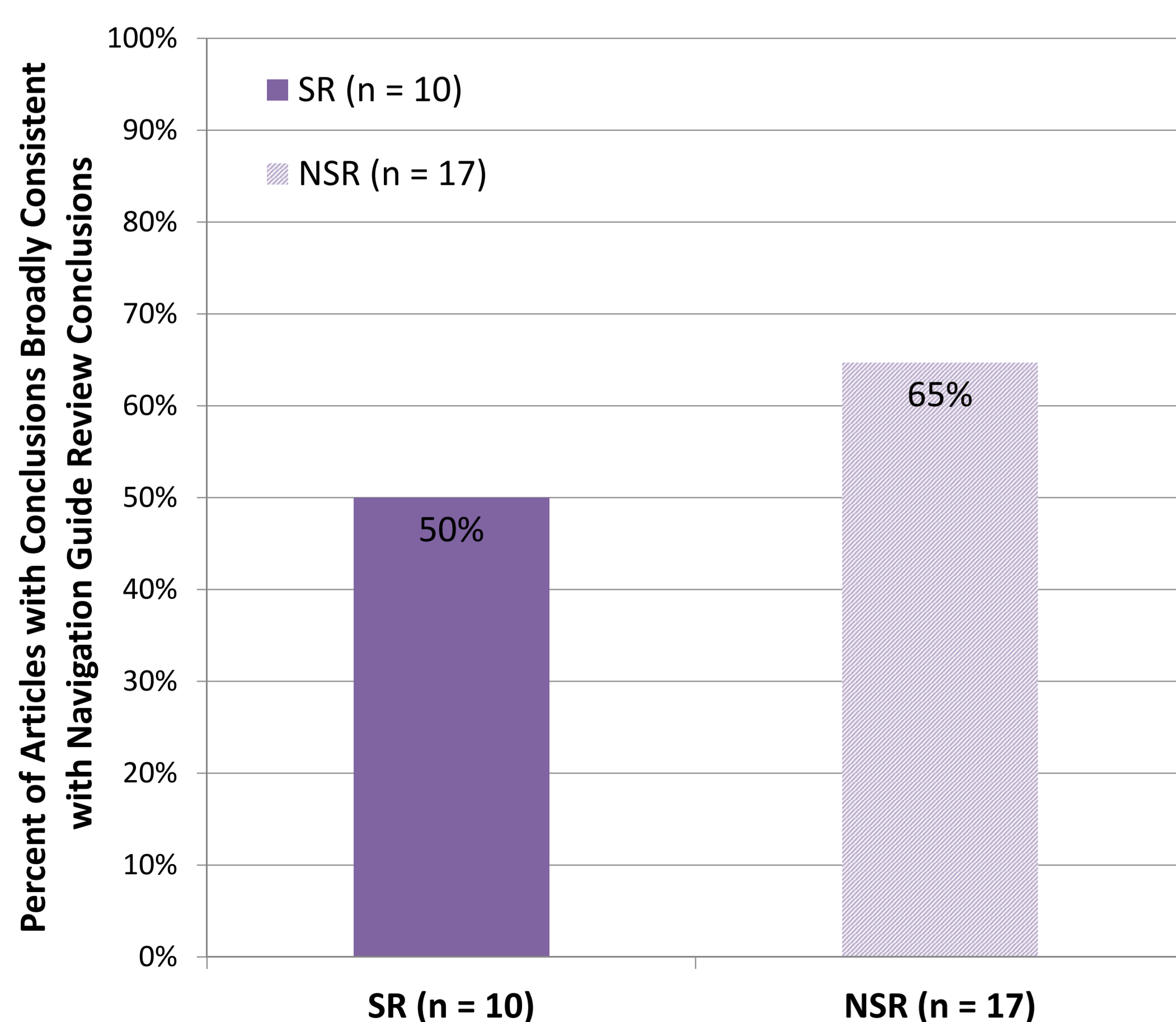


Figure 3 Key:
■ Self-Identified Systematic Reviews (SR)
■ Non-Systematic Reviews (NSR)

Figure 4. Satisfactory Appraisal Ratings Comparison between SR vs NSR, by Domain

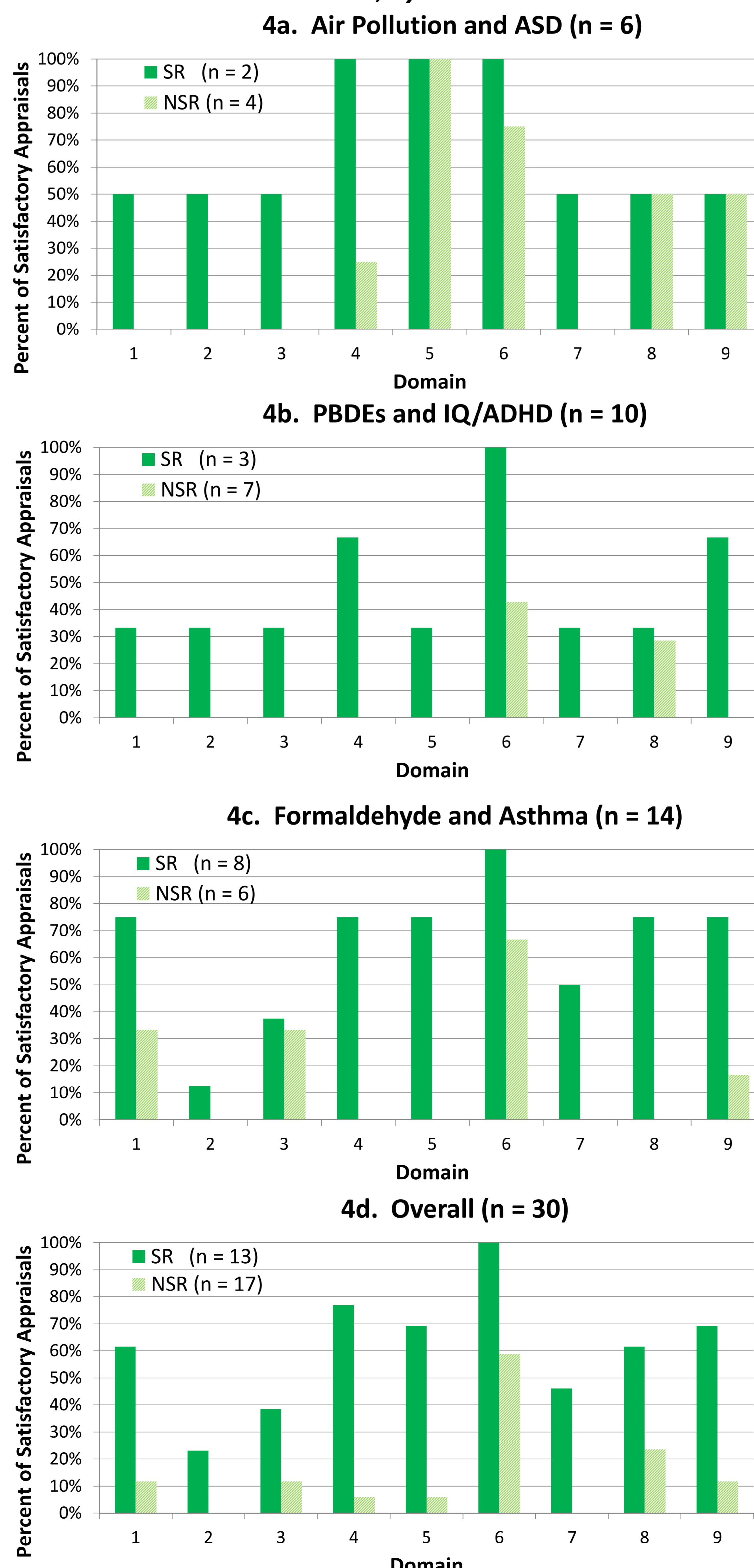


Figure 4 Key:
■ Self-Identified Systematic Reviews (SR)
■ Non-Systematic Reviews (NSR)

Discussion

- Appraisal across all 9 domains specified by LRAT was consistently better among self-identified systematic reviews compared to non-systematic reviews.
- All non-systematic reviews fell short of every single domain except for Directness of evidence (Domain 6).
- None of the non-systematic reviews provided a protocol (Domain 2) or appraised the quality of evidence (Domain 7).
- Overall, reviews struggled to meet Satisfactory criteria in Domains 2) Protocol, 3) Interests and contributions, and 7) Methodological quality of evidence.
- The only domain in which more than 50% of both systematic reviews and non-systematic reviews earned a Satisfactory rating was 6) Directness of evidence.
- The Formaldehyde and Asthma case study (n = 14 reviews) produced the best-performing reviews. This may be due to selecting a subset of most recent studies from a large body of evidence.
- Systematic reviews produced discrepant results. Roughly half of all the reviews arrived at conclusions that were broadly consistent with the Navigation Guide systematic review method case study conclusions on the same topic.

Conclusions

- Systematic reviews are not all equal.** Among self-described systematic reviews, implementation of all of the features of robust systematic review methods was highly variable. Half of the reviews produced different conclusions.
- Systematic review methods result in more transparent and reproducible results than non-systematic reviews on the same topic.** While reviewers might arrive at a similar answer without applying systematic review methods, the lack of transparency impedes timely decision making.
- Environmental health scientists should be trained in improved methods for evidence integration.** The lack of consistently applying robust methods to synthesize available data identified in this small study may be prevalent in the field as these methods are new to environmental health.
- Environmental health scientists should work closely with information specialists in conducting reviews.** A comprehensive search strategy is integral to a systematic review. To improve the transparency and quality of literature searches environmental health scientists need to engage the expertise of information specialists in conducting reviews.