Supplemental Material

Methods to assess dermal exposures in occupational settings: a scoping review

Authors and affiliations
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Table S1. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	3-4
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	4
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	5
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	5
Information sources[1]	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	6
Selection of sources of evidence[2]	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process[3]	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	9-13
Critical appraisal of individual sources of evidence[4]	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	NA
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	13-14

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	Figure 1
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	NA
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	Supplemental Material dataset
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	13-14
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	14-16
Limitations	20	Discuss the limitations of the scoping review process.	16
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	17
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	17 (source of funding provided for the present study)

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

[1] Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

[2] A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

[3] The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

[4] The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

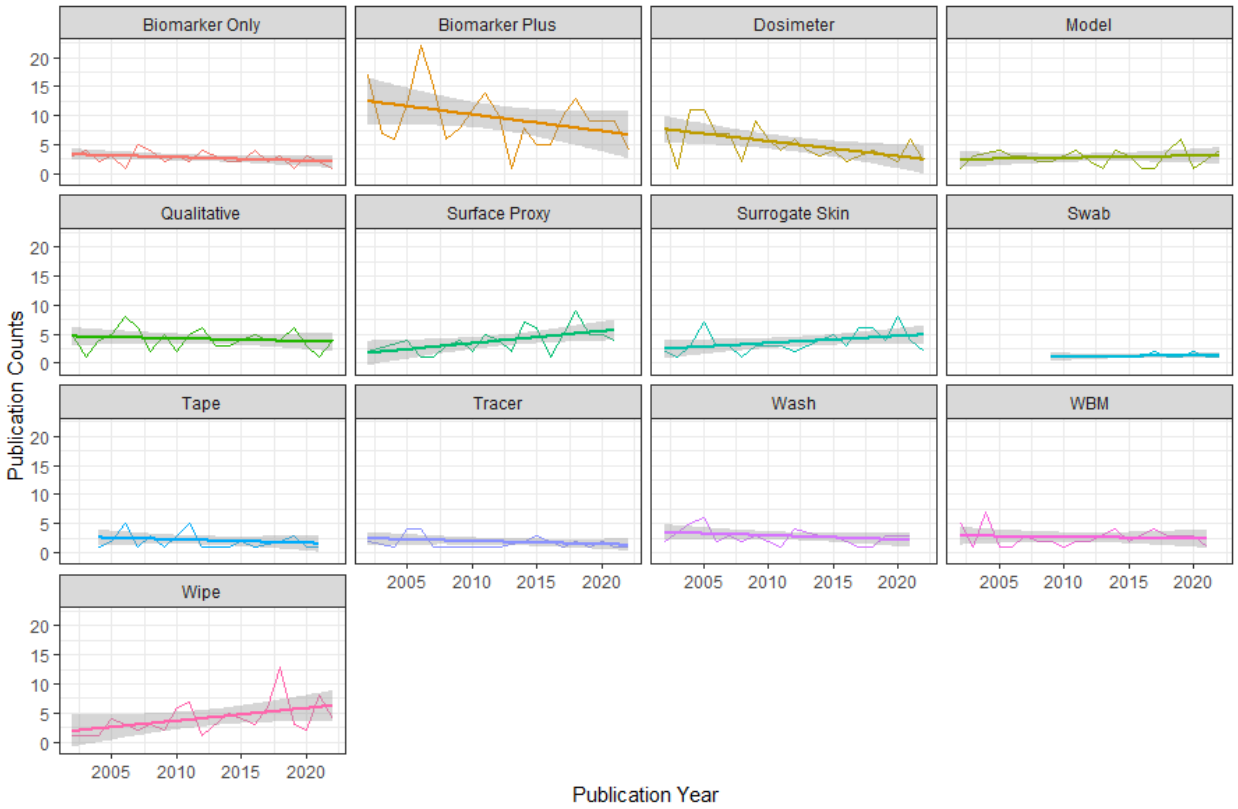

Figure S1. All data charted articles: publication counts (y-axis) for each type of data charted dermal exposure assessment method over the timeline (2002-2022) encompassed by present study's scope (x-axis). Definitions for dermal exposure assessment methods are presented in Table 2. WBM = whole body method.

Figure S2. Methods type studies: publication counts (y-axis) for each type of data charted dermal exposure assessment method over the timeline (2002-2022) encompassed by present study's scope (x-axis). Definitions for dermal exposure assessment methods are presented in Table 2. WBM = whole body method.

Figure S3. Exposure assessment studies: publication counts (y-axis) for each type of data charted dermal exposure assessment method over the timeline (2002-2022) encompassed by present study's scope (x-axis). Definitions for dermal exposure assessment methods are presented in Table 2. WBM = whole body method.

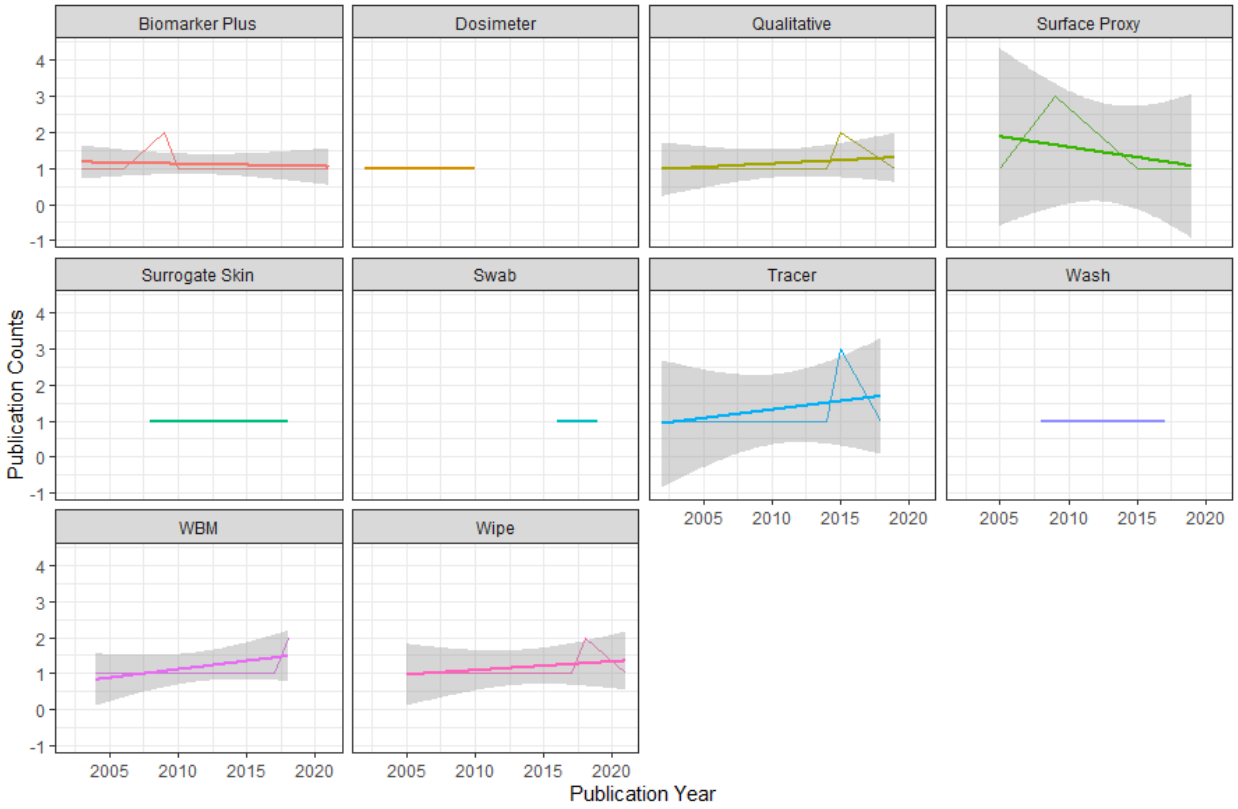

Figure S4. Controls and protective measures studies: publication counts (y-axis) for each type of data charted dermal exposure assessment method over the timeline (2002-2022) encompassed by present study's scope (x-axis). Definitions for dermal exposure assessment methods are presented in Table 2. WBM = whole body method.

Figure S5. Health outcomes/risk assessment/epidemiological studies: publication counts (y-axis) for each type of data charted dermal exposure assessment method over the timeline (2002-2022) encompassed by present study's scope (x-axis). Definitions for dermal exposure assessment methods are presented in Table 2. WBM = whole body method.

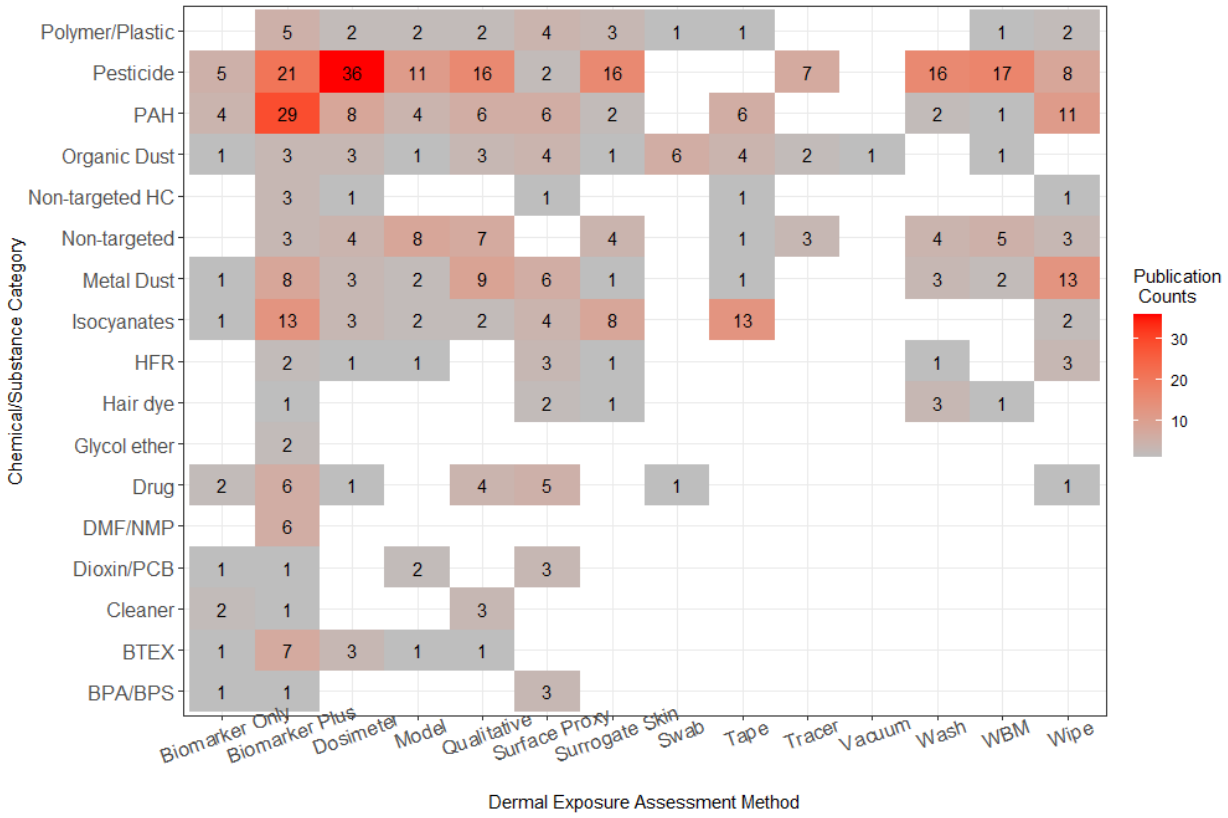

Figure S6: Heat map across data charted chemical/substance categories and dermal exposure assessment methods using only the articles identified from literature base pull (n = 284). The colors reflect publication counts where hotter colors reflect higher counts. The absence of number tiles reflects gaps in literature for a given substance/method combination. The definitions for dermal exposure assessment methods are presented in Table 2 while definitions for the chemical/substance categories are presented in Table 3. Abbreviations are as follows: PAH = polycyclic aromatic hydrocarbon; HC = hydrocarbon; HFR = halogenated flame retardant; DMF/DMP = N,N-dimethylformamide and N-methyl-2-pyrrolidone; PCB = polychlorinated bisphenol; BTEX = benzene, toluene, ethylbenzene, and xylene; BPA/BPS = bisphenol A, bisphenol S, and/or 4-hydroxyphenyl 4-isoprooxyphenylsulfone; WBM = whole body method.

Table S2. Analysis of journals and article types identified by screening included article reference lists. These journals were found only through screening of included article reference lists and not in the original data base pulls.

Journal	Articles	Chemical / substance types	Method types
Environmental Health Perspectives	8	PAH, pesticide, non-targeted HC, dioxin/PCB, BPA/BPS, HFR	Skin taping, biomarker, qualitative, model, skin wipe
Archives of Toxicology	3	DMF/NMP, PAH	Biomarker plus
Bulletin of Environmental Contamination and Toxicology	3	Pesticides	Dosimeter, surrogate skin
Journal of Hazardous Materials	3	Pesticide, PAH, DMF/NMP	Whole body method, biomarker, surrogate skin
Chemico-Biological Interactions	2	BTEX, PAH	Biomarker plus
Epidemiology	2	Pesticide, Drug (antineoplastic)	Qualitative, biomarker, surrogate skin, skin wash
Infection Control and Hospital Epidemiology	2	Microorganisms	Skin swab, surface proxy, patrial body cover, skin wash
International Journal of Occupational and Environmental Health	2	Pesticides	Whole body method, surrogate skin, skin wash, skin wipe, biomarker plus, qualitative
Journal of the American Medical Association	2	BPA/BPS, microorganism	Biomarker plus, visual tracer, qualitative
ACS Sustainable Chemistry and Engineering	1	Pesticide	Visual tracer, whole body method, surrogate skin
Aerospace Medicine and Human Performance	1	HFR	Biomarker plus, surrogate skin
Annals of Epidemiology	1	Pesticide	Biomarker plus, qualitative
Antimicrobial Agents and Chemotherapy	1	Cleaner	Biomarker only
BMJ Open	1	PAH	Biomarker only
Canadian Medical Association Journal	1	Microorganism	Visual tracer, qualitative
Carcinogenesis	1	PAH	Biomarker plus
Emerging Infectious Diseases	1	Microorganism	Surrogate skin, skin wash, whole body method, visual tracer, qualitative
European Journal of Surgical Oncology	1	Drug (antineoplastic)	Surrogate skin, surface proxy
Heliyon	1	Pesticide	Whole body method, surrogate skin
IDCases	1	Microorganism	Visual tracer, qualitative
International Journal of Occupational Safety and Ergonomics	1	Pesticide	Whole body method, surrogate skin, skin wash, skin wipe
Journal of Consumer Protection and Food Safety	1	Pesticide	Model
Journal of Health Science	1	Drug (antineoplastic)	Biomarker plus, surface proxy
Journal of Oncology Pharmacy Practice	1	Drug (antineoplastic)	Biomarker plus, surface proxy
Journal of Pharmaceutical and Biomedical Analysis	1	Drug (antineoplastic)	Biomarker only
Regulatory Toxicology and Pharmacology	1	Pesticide	Biomarker only
Canadian Journal of Hospital Pharmacy	1	Drug (antineoplastic)	Skin wipe
Toxicology	1	PAH	Biomarker plus