United States
Environmental Protection Agency

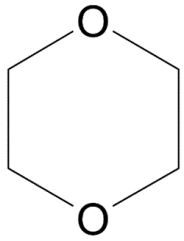
Office of Chemical Safety and
Pollution Prevention

Final Risk Evaluation for 1,4-Dioxane

Systematic Review Supplemental File:

Data Quality Evaluation of Consumer Exposure Studies

CASRN: 123-91-1



December 2020

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Refer to Appendix E of '*Application of Systematic Review in TSCA Risk Evaluations*' at https://www.epa.gov for more information of evaluation procedures and parameters.

Study Citation:	Batterman, S.,Jia, C.,Hatzivasilis, G.. 2007. Migration of volatile organic compounds from attached garages to residences: A major exposure source. Environmental Research.
Data Type	Monitoring
Hero ID	1065558

Domain		Metric	Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology	High	1	passive samplers. tenax absorbant. samples stored 1-3 days before analysis.
	Metric 2:	Analytical Methodology	High	1	analytical details reported in another paper, but recoveries, blanks, methods, etc. discussed.
	Metric 3:	Biomarker Selection	N/A	N/A	indoor air
Domain 2: Representativeness					
	Metric 4:	Geographic Area	High	1	
	Metric 5:	Currency	Medium	2	around 2007
	Metric 6:	Spatial and Temporal Variability	Medium	2	15 samples, but sample is not random or necessarily representative, although it may capture much of the variation in the sampled communities.
	Metric 7:	Exposure Scenario	Medium	2	indoor air, but directly related to consumer products.
Domain 3: Accessibility/Clarity					
	Metric 8:	Reporting of Results	Medium	2	No raw data. Mean, SD. Max, DF
	Metric 9:	Quality Assurance	Medium	2	recoveries, blanks discussed, although not specific to chemical.
Domain 4: Variability and Uncertainty					
	Metric 10:	Variability and Uncertainty	High	1	SD provided. Investigated various variables.
Overall Quality Determination*			High	1.6	
Extracted			No		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Gibson, W. B., Keller, P. R., Foltz, D. J., Harvey, G. J.. 1991. Diethylene glycol mono butyl ether concentrations in room air from application of cleaner formulations to hard surfaces. Journal of Exposure Analysis and Environmental Epidemiology.
Data Type	Experimental
Hero ID	28308

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology does not reference a SOP but is described in detail and scientifically sound.
	Metric 2:	Analytical Methodology	Medium	2	Analytical methodology does not reference a SOP but is described in detail and scientifically sound.
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Surface cleaners, rooms, and other testing conditions were selected to represent exposure scenario.
	Metric 5:	Sample Size and Variability	Low	3	Multiple timed samples taken from just two cleaners; exp with each cleaner was duplicated but with slightly different masses
	Metric 6:	Temporality	Low	3	Data is over 15 years old, 1999 paper
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	High	1	Data is reported and complete
	Metric 8:	Quality Assurance	N/A	N/A	No quality control issues were identified; calibration curve and correlation reported
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Some discussion is included related to the uncertainty and variability.
Overall Quality Determination[*]			Medium	2.0	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Sack, T. M., Steele, D. H., Hammerstrom, K., Remmers, J.. 1992. A survey of household products for volatile organic compounds. Atmospheric Environment.
Data Type	Experimental
Hero ID	28339

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	
	Metric 2:	Analytical Methodology	Low	3	calibration for the additional analytes was performed on only one of the five instruments, it was assumed that the response calibration for that instrument was a reasonable estimate for the other four GC/MS systems.
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	
	Metric 5:	Sample Size and Variability	Medium	2	number of products per category varied. Replicates tests for some products, but not all.
	Metric 6:	Temporality	Low	3	>15 yrs old
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	no raw data. Only average reported.
	Metric 8:	Quality Assurance	N/A	N/A	Precision was determined by repeated analysis of one of the calibration standard solutions and by duplicate analysis of a number of the household products
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Because the methodology for the actual GC/MS analyses was designed for the determination of the original six chlorinated solvents, the highest confidence is placed upon the results for those analytes. For the additional 25 analytes, the analytical system was calibrated approximately 2 years later under conditions designed to replicate the original system. As a result, the reported concentration values for the additional 25 analytes should be regarded as estimates. As a result of this comparison, it was estimated that in the worst case, a reported concentration value for one of the 25 additional analytes may be off by a factor in the range of 0.2-5.

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Study Citation:	Sack, T. M., Steele, D. H., Hammerstrom, K., Remmers, J.. 1992. A survey of household products for volatile organic compounds. Atmospheric Environment.
Data Type	Experimental
Hero ID	28339

Domain	Metric	Rating†	Score	Comments‡
Overall Quality Determination*		Low	2.3	
Extracted		Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Nestmann, E. R., Otson, R., Kowbel, D. J., Bothwell, P. D., Harrington, T. R.. 1984. Mutagenicity in a modified Salmonella assay of fabric-protecting products containing 1,1,1-trichloroethane. Environmental and Molecular Mutagenesis.
Data Type	Experimental
Hero ID	194339

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methods were referenced, but were not a widely accepted source.
	Metric 2:	Analytical Methodology	Medium	2	Analytical methods were referenced, but were not a widely accepted source; all equipment provided for GC/MS
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Appropriate for data of interest - WF in Fabric protector (Table 3)
	Metric 5:	Sample Size and Variability	Low	3	Low sample size, two fabric protectors were tested.
	Metric 6:	Temporality	Low	3	1984 paper, source of tested items is older than 15 years
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	High	1	Data is all reported and appears to be complete and accurate.
	Metric 8:	Quality Assurance	N/A	N/A	Identified issues were minor and addressed
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Study does include some discussion on variability and uncertainty.
Overall Quality Determination[*]			Medium	2.0	
Extracted			No		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Batterman, S.,Jia, C.,Hatzivasilis, G.. 2007. Migration of volatile organic compounds from attached garages to residences: A major exposure source. Environmental Research.
Data Type	Experimental
Hero ID	1065558

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	Sampling methodology discussed in detail following methodology in previously published study; sampling equipment, storage, and conditions described
	Metric 2:	Analytical Methodology	High	1	AER measured using constant injection of PFT emitters and passive samplers; samples analyzed by GC/MS; MDLs reported
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Testing scenarios likely normal but selection of homes and participants not necessarily random or representative; range of testing conditions exists across selected homes
	Metric 5:	Sample Size and Variability	High	1	Sample size = 15 homes; replicate samples taken
	Metric 6:	Temporality	Medium	2	Study from 2007, 13 years ago
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	High	1	Raw concentration data provided for each house/garage and VOC; summary statistics provided for each VOC for all houses
	Metric 8:	Quality Assurance	N/A	N/A	At least one field blank collected for each house (25 total blanks); sampling performance evaluated; recoveries 75-128 percent
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	High	1	Spatial and temporal variability evaluated; uncertainties and gaps identified
Overall Quality Determination*			High	1.3	
Extracted			Yes		

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Study Citation:	Batterman, S.,Jia, C.,Hatzivasilis, G.. 2007. Migration of volatile organic compounds from attached garages to residences: A major exposure source. Environmental Research.
Data Type	Experimental
Hero ID	1065558

Domain	Metric	Rating†	Score	Comments‡

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Tanabe, A., Kawata, K.. 2008. Determination of 1,4-dioxane in household detergents and cleaners. Journal of AOAC International.
Data Type	Experimental
Hero ID	2013802

Domain		Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Not a standard but details provided
	Metric 2:	Analytical Methodology	High	1	
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Household detergents and cleaners currently sold in Japan, may not be in US
	Metric 5:	Sample Size and Variability	High	1	n=40 with 1,4 dioxane
	Metric 6:	Temporality	Medium	2	2008 study, >5 to 15 years
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	mean, max, min provided for product group but not individual concentrations
	Metric 8:	Quality Assurance	N/A	N/A	recoveries and replicate samples discussed
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Kruskal Wallis test use to capture variability in results
Overall Quality Determination[*]			Medium	1.7	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Jo, W. K., Lee, J. H., Lim, H. J., Jeong , W. S.. 2008. Naphthalene emissions from moth repellents or toilet deodorant blocks determined using head-space and small-chamber tests. Journal of Environmental Sciences.
Data Type	Experimental
Hero ID	2331549

Domain		Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	sampling methodology was described and scientifically sound
	Metric 2:	Analytical Methodology	High	1	analytical methodologies were cited and from widely accepted sources (e.g., EPA and ASTM Methods)
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	The data likely represent the relevant exposure scenario; some drawbacks due to mixing as it is a chamber study
	Metric 5:	Sample Size and Variability	Medium	2	seven products were tested (only 1 contained 1,4-Dioxane)
	Metric 6:	Temporality	Medium	2	source of tested items could be less consistent with current exposures (between 5-15 years)
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	Data is reported for each product along with summary statistics; frequency of detection was low for 1,4-Dioxane (was not detected in 6/7 samples)
	Metric 8:	Quality Assurance	N/A	N/A	Laboratory and field blank traps, spiked samples
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	limited discussion on variability and uncertainty
Overall Quality Determination[*]			Medium	1.9	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Kwon, K.,iD, Jo, W., Lim, H., Jeong, W.. 2007. Characterization of emissions composition for selected household products available in Korea. Journal of Hazardous Materials.
Data Type	Experimental
Hero ID	2443123

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	
	Metric 2:	Analytical Methodology	High	1	
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Products from Korea, but results are likely similar to US
	Metric 5:	Sample Size and Variability	High	1	n=59 household products
	Metric 6:	Temporality	Medium	2	2007 study, >5 to 15 years
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	concentration of all analytes per product reported, no summaries
	Metric 8:	Quality Assurance	N/A	N/A	Quality assurance/quality control techniques and results were not directly discussed, but can be implied through the study"s use of standard field and laboratory protocols
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Variability addressed, key uncertainties, limitations, and data gaps are not discussed
Overall Quality Determination*			Medium	1.7	
Extracted			Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Kim, K. W., Lee, B. H., Kim, S., Kim, H. J., Yun, J. H., Yoo, S. E., Sohn, J. R.. 2011. Reduction of VOC emission from natural flours filled biodegradable bio-composites for automobile interior. Journal of Hazardous Materials.
Data Type	Experimental
Hero ID	3538078

Domain		Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Two methods employed, both described in detail but not cited from a source
	Metric 2:	Analytical Methodology	Low	3	GC/MS method and instruments widely acceptable, but no limits reported
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Low	3	Temperature varied to represent different seasons for cars; discrepancy between air exchange rates between two methods
	Metric 5:	Sample Size and Variability	Low	3	n=5 for each neat and composite (pineapple and cassava) material; only two data points for 1,4-dioxane
	Metric 6:	Temporality	Medium	2	2011 study, <10 years
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	Emission factor data reported for TVOC in graphs, 1,4 dioxane reported in text with single data points only for each composite
	Metric 8:	Quality Assurance	N/A	N/A	Multiple methods tested and compared but not obvious the distinction between TVOC and chemical emissions
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Key uncertainties, limitations, and data gaps are not discussed
Overall Quality Determination[*]			Low	2.7	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Saraji, M., Shirvani, N.. 2017. Determination of residual 1,4-dioxane in surfactants and cleaning agents using headspace single-drop microextraction followed by gas chromatography-flame ionization detection. International Journal of Cosmetic Science.
Data Type	Experimental
Hero ID	3538324

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology was not a current standard, but sampling methods were being tested. These were discussed and explained.
	Metric 2:	Analytical Methodology	Medium	2	Analytical Methods were being tested in this experiment. Not a current standard, but full descripted and scientifically sound
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Testing conditions closely represent relevant exposure scenarios
	Metric 5:	Sample Size and Variability	Low	3	for the products of interest, 4 concentrations were taken to fit calibration curve (n = 4)
	Metric 6:	Temporality	High	1	Products appear to be current, <5 years
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	High	1	All data and equations appear to be reported and complete.
	Metric 8:	Quality Assurance	N/A	N/A	No quality control issues were identified
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Very limited discussion on uncertainties, limitations, and data gaps
Overall Quality Determination[*]			Medium	1.9	
Extracted			No		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Tahara, M., Obama, T., Ikarashi, Y.. 2013. Development of analytical method for determination of 1,4-dioxane in cleansing products. International Journal of Cosmetic Science.
Data Type	Experimental
Hero ID	3539090

Domain		Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Not a standard but sample prep provided in detail
	Metric 2:	Analytical Methodology	High	1	
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Japanese products but main surfactants likely similar/same in US
	Metric 5:	Sample Size and Variability	High	1	n=15 products
	Metric 6:	Temporality	Medium	2	2013 study, >5 to 15 years old
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	concentration per product listed, no summaries, chromatograms provided
	Metric 8:	Quality Assurance	N/A	N/A	standard curves used, calibration detailed in water
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Limited discussion of uncertainties, gaps, and limitations
Overall Quality Determination[*]			Medium	1.9	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Farajzadeh, M., Nassiry, P., Mogaddam, M. R. A.. 2016. Development of a New Dynamic Headspace Liquid-Phase Microextraction Method. Chromatographia.
Data Type	Experimental
Hero ID	3565197

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methods are new but are clearly described and scientifically sound
	Metric 2:	Analytical Methodology	Medium	2	Analytical methods are new but are clearly described and scientifically sound
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Testing conditions closely represent relevant exposure scenarios
	Metric 5:	Sample Size and Variability	Low	3	Method tested at each analyte level for each product (n=3); n=1 raw sample for each product
	Metric 6:	Temporality	High	1	tested items appear to be current (4 yr)
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	Single raw concentration value reported; only summary statistics report for relative recoveries (no raw data)
	Metric 8:	Quality Assurance	N/A	N/A	No quality control issues were identified
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	High	1	Very limited discussion on uncertainties, limitations, and data gaps
Overall Quality Determination[*]			Medium	1.7	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Eusterbrock, L., Lehmann, J., Ziegler, G.. 2003. Analysis of pyrolysis products during thermal decomposition of organic components in ceramic green bodies.
Data Type	Experimental
Hero ID	3579327

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology is described.
	Metric 2:	Analytical Methodology	Medium	2	The analytical methodology was described.
	Metric 3:	Biomarker Selection	N/A	N/A	biomarker was not used in this experiment
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	The testing methodology was relevant to the process of generating flue gas and collecting contaminants.
	Metric 5:	Sample Size and Variability	Low	3	It appears that only two samples were collected/analyzed for 1.4D
	Metric 6:	Temporality	Low	3	This study is >15 years old
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	Results were only provided in graph form.
	Metric 8:	Quality Assurance	N/A	N/A	QA/QC measures were not reported
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	The graph displayed the variation between two measurements.
Overall Quality Determination*			Low	2.6	
Extracted			No		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Makino, R., Kawasaki, H., Kishimoto, A., Gamo, M., Nakanishi, J.. 2006. Estimating health risk from exposure to 1,4-dioxane in Japan. Environmental Sciences.
Data Type	Experimental
Hero ID	3660508

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology is discussed but some sampling information is not provided (i.e., sampling conditions, equipment, sample storage conditons/duration)
	Metric 2:	Analytical Methodology	Medium	2	Analytical methodology discussed and adequate but some missing information (i.e., recovery samples, instrument calibration)
	Metric 3:	Biomarker Selection	N/A	N/A	biomarker is not used.
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Testing conditions likely represent exposure scenario but some information is not described.
	Metric 5:	Sample Size and Variability	Low	3	Samples size moderate, but replicate tests not perfomed
	Metric 6:	Temporality	Low	3	>15 years (2003)
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	Summary statistics are reported but are missing one or more parameters
	Metric 8:	Quality Assurance	N/A	N/A	Quality assurance/quality control techniques and results were not directly discussed, but can be implied.
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Key uncertainties, limitations, and data gaps are not discussed
Overall Quality Determination[*]			Low	2.4	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Stachowiak-Wencek, A., Pradzynski, W., Matenko-Nozewnik, M.. 2014. EMISSION OF VOLATILE ORGANIC COMPOUNDS (VOC) FROM UV-CURED WATER-BASED LACQUER PRODUCTS. Drewno.
Data Type	Experimental
Hero ID	3809004

Domain		Metric	Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	
	Metric 2:	Analytical Methodology	High	1	
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Wood and lacquer products relevant, better match for commercial scale than residential/consumer
	Metric 5:	Sample Size and Variability	Medium	2	3 pieces of wood and 3 lacquers each (n=9), 2 samples for each compound/wood (n=18)
	Metric 6:	Temporality	Medium	2	Study from 2014, >5 to 15 years old
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	24 h and 72 h raw concentrations reported
	Metric 8:	Quality Assurance	N/A	N/A	Samples also taken from uncoated wood pieces
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Variability characterized but key uncertainties and gaps not identified
Overall Quality Determination*			Medium	1.9	
Extracted			Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Kwon, K. D., Jo, W. K.. 2007. Indoor Emission Characteristics of Liquid Household Products using Purge - and - Trap Method.
Data Type	Experimental
Hero ID	3809005

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling conditions and methodology clearly described and methods validated
	Metric 2:	Analytical Methodology	Medium	2	Not known standard but methods and instrumentation detailed
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Products selected likely relevant to consumer scenario but purchased in Korea
	Metric 5:	Sample Size and Variability	High	1	
	Metric 6:	Temporality	Medium	2	2007, >5 to 15 years old
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	Raw concentrations reported, no summaries
	Metric 8:	Quality Assurance	N/A	N/A	
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Key uncertainties, limitations, and data gaps are not discussed
Overall Quality Determination[*]			Medium	2.0	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Lin, W. T., Chen, W. L., Cheng, W. C., Chang, H. C., Tsai, S. W.. 2017. Determining the Residual Characteristics of Alkylphenols, Arsenic, and Lead as well as Assessing the Exposures of 1,4-Dioxane from Household Food Detergents. Journal of AOAC International.
Data Type	Experimental
Hero ID	3828958

Domain		Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology was reported and scientifically sound, but was not only from widely accepted sources.
	Metric 2:	Analytical Methodology	Medium	2	Analytical methodology was reported and scientifically sound, but was not only from widely accepted sources; headspace SPME-GC-MS method
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Testing conditions closely represent relevant exposure scenarios - dish washing
	Metric 5:	Sample Size and Variability	High	1	80 different food detergents were included.
	Metric 6:	Temporality	High	1	Sources of tested items appears to be current (within 5 years); 2017 study
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	Summary stats reported in text; raw data (individual WF for all food detergents) are not reported, and therefore summary statistics cannot be reproduced. No measure of variation included.
	Metric 8:	Quality Assurance	N/A	N/A	No quality control issues were identified; stock solutions calibrated
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Very limited discussion on the variability and uncertainty.
Overall Quality Determination[*]			Medium	1.9	
Extracted			Yes		

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Study Citation:	Lin, W. T., Chen, W. L., Cheng, W. C., Chang, H. C., Tsai, S. W.. 2017. Determining the Residual Characteristics of Alkylphenols, Arsenic, and Lead as well as Assessing the Exposures of 1,4-Dioxane from Household Food Detergents. Journal of AOAC International.
Data Type	Experimental
Hero ID	3828958

Domain	Metric	Rating[†]	Score	Comments[‡]

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Myllari, V., Hartikainen, S., Poliakova, V., Anderson, R., Jonkkari, I., Pasanen, P., Andersson, M., Vuorinen, J.. 2016. Detergent impurity effect on recycled HDPE: Properties after repetitive processing. Journal of Applied Polymer Science.
Data Type	Experimental
Hero ID	3830103

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology was described and cited - did not come from widely accepted source.
	Metric 2:	Analytical Methodology	High	1	Analytical methodologies were described and cited from widely accepted source (e.g., ASTM)
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Testing conditions closely represent relevant exposure scenarios, recycled plastics
	Metric 5:	Sample Size and Variability	Low	3	n=5, 1,4-Dioxane concentration includes points at 5 different extrusions.
	Metric 6:	Temporality	High	1	Sources of tested items appears to be current (within 5 years), 2016 study
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	1,4-Dioxane concentrations are only reported in a figure - do not have text or tabulated data
	Metric 8:	Quality Assurance	N/A	N/A	No quality control issues were identified
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	some discussion included on uncertainties, limitations, and data gaps
Overall Quality Determination*			Medium	1.9	
Extracted			No		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Fuh, C. B., Lai, M., Tsai, H. Y., Chang, C. M.. 2005. Impurity analysis of 1,4-dioxane in nonionic surfactants and cosmetics using headspace solid-phase microextraction coupled with gas chromatography and gas chromatography-mass spectrometry. Journal of Chromatography A.
Data Type	Experimental
Hero ID	4149695

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Sampling methodology not cited but described and sound
	Metric 2:	Analytical Methodology	High	1	
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Low	3	Products are reasonable but all from Taiwan
	Metric 5:	Sample Size and Variability	Medium	2	n=6 for surfactants, n=27 for products
	Metric 6:	Temporality	Medium	2	2005 study, 15 years old
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	Range and standard dev given but not all raw data for each product
	Metric 8:	Quality Assurance	N/A	N/A	Results compared to other literature, recoveries reported
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination[*]			Low	2.3	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Danish EPA,. 2018. Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home.
Data Type	Experimental
Hero ID	6302983

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	Climate chamber tests were performed according to ISO 16000-9/11, prEN 16516
	Metric 2:	Analytical Methodology	High	1	Sampling and analysis of VOC was carried out according to ISO 16000-6, LOD for 1,4 D provided.
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Low	3	Tests conducted under a single set of conditions.
	Metric 5:	Sample Size and Variability	Low	3	Sample size small; only one test conducted for 1,4D, although data were collected at 3 sampling intervals.
	Metric 6:	Temporality	High	1	Study conducted April-December 2017
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	Only one test was conducted; results reported for 3 sampling intervals.
	Metric 8:	Quality Assurance	N/A	N/A	QA/QC not discussed but implied through the use of ISO methods for sampling and analysis.
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Low	3	The report noted that the estimated uncertainty for sample preparation and sampling is 20-40 percent depending on the sample type and collection volume. No discussion of data gaps or limitations.
Overall Quality Determination[*]			Medium	2.0	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Won, D.,., N.,ong, G.,., Y.,ang, W.,., C.,ollins, P.,.. 2014. Material Emissions Testing: VOCs from Wood, Paint, and Insulation Materials.
Data Type	Experimental
Hero ID	6322475

Domain		Metric	Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	Tests according to ASTM D5116-2010
	Metric 2:	Analytical Methodology	High	1	GS/MS for samples from Tenax/Carbograph and Tenax coated with PFPH
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	Specific mention of "do-it-yourself" two-component spray foam insulation product
	Metric 5:	Sample Size and Variability	High	1	n=30 building materials tested for 121 VOCs measured
	Metric 6:	Temporality	Medium	2	2014 study, 5 to 15 years
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	High	1	Conc and EF at timed intervals; summary data for EFs
	Metric 8:	Quality Assurance	N/A	N/A	Background and blank samples
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Characterizes variability in the media studied
Overall Quality Determination*			High	1.3	
Extracted			Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Poppendieck, D., Schlegel, M., Connor, A., Blickley, A.. 2017. Flame retardant emissions from spray polyurethane foam insulation [Author's manuscript]. Journal of Occupational and Environmental Hygiene.
Data Type	Experimental
Hero ID	6322476

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	NIST and ASTM standards; detailed methods, equipment, etc.
	Metric 2:	Analytical Methodology	High	1	
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	1,4D concentrations shown at 40C, not necessarily applicable to all seasons (summer only)
	Metric 5:	Sample Size and Variability	High	1	n>10
	Metric 6:	Temporality	High	1	2019 study
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Low	3	1,4 dioxane concentrations reported in graphs; other data provided in text
	Metric 8:	Quality Assurance	N/A	N/A	Chamber control used, other details not provided but unlikely to impact the results
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Variability in foams, chamber conditions, uncertainties and limitations discussed
Overall Quality Determination*			High	1.6	
Extracted			No		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Emmerich, S. J., Gorfain, J. E., Huang, M., Howard-Reed, C.. 2003. Air and Pollutant Transport from Attached Garages to Residential Living Spaces - NISTIR 7072.
Data Type	Experimental
Hero ID	6811748

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	The pressurization tests were generally conducted according to ASTM Standard E 779-99 (ASTM 1999) using blower doors.
	Metric 2:	Analytical Methodology	Medium	2	Error analysis and confidence intervals calculated according to ASTM standard 799-99 but no detection limits reported.
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Testing scenario appropriate but specific to DC and results aligned with results from other studies
	Metric 5:	Sample Size and Variability	Medium	2	Sample size = 5 houses
	Metric 6:	Temporality	Low	3	Study from 2003, >15 years ago
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	Effective leakage area (ELA) and air change rate (ACH) data reported for all houses; average and stardard deviations reported.
	Metric 8:	Quality Assurance	N/A	N/A	QA/QC not discussed but implied through adherence to ASTM standards
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Variations in houses tested and respective results are characterized; results compared to other studies to identify data gaps or uncertainties
Overall Quality Determination*			Medium	2.0	
Extracted			Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	CPSC,. 2009. Summary of Contractor's Indoor Air Quality Assessment of Homes Containing Chinese Drywall.
Data Type	Experimental
Hero ID	6833550

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	High	1	sampling methodologies were compliant with EPA, CDC, ASTDR approaches
	Metric 2:	Analytical Methodology	High	1	analytical methods were well described and referenced from widely accepted sources (ASTM, EPA, NIOSH)
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	High	1	testing conditions closely represent relevant exposure scenario
	Metric 5:	Sample Size and Variability	High	1	n=13 (number of primary and duplicate pairs above reporting limit) for 1,4-Dioxane
	Metric 6:	Temporality	Medium	2	sources of tested items could be less consistent with current exposures (5-15 years)
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	All individual data is not reported; summary statistics are detailed and complete
	Metric 8:	Quality Assurance	N/A	N/A	quality assurance/control measures were applied and only minor issues were identified
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	High	1	Discussion included surrounding variability and uncertainty - section in article dedicated to limitations
Overall Quality Determination[*]			High	1.3	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	CPSC,. 2011. Indoor Environmental Quality Assessment of Residences Containing Problem Drywall: Six-Home Follow-Up Study.
Data Type	Experimental
Hero ID	6833552

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology and Conditions	Medium	2	Methodology discussed and generally appropriate but not all details provided; unlikely to have substantial impact on results
	Metric 2:	Analytical Methodology	High	1	GC/MS according to EPA"s Method TO-15; air exchange via ASTM Standard E741-00
	Metric 3:	Biomarker Selection	N/A	N/A	
Domain 2: Representative					
	Metric 4:	Testing Scenario	Medium	2	Data likely represent standard home scenarios; temperature, RH, and dew point varied and recorded
	Metric 5:	Sample Size and Variability	Medium	2	n=6 homes
	Metric 6:	Temporality	Medium	2	2011, 9 years ago
Domain 3: Accessibility/Clarity					
	Metric 7:	Reporting of Results	Medium	2	ACH ranges and graphs provided; raw concentration data for all chemicals
	Metric 8:	Quality Assurance	N/A	N/A	Recoveries reported, QA/QC methods outlined
Domain 4: Variability and Uncertainty					
	Metric 9:	Variability and Uncertainty	Medium	2	Limited characterization of variability in houses and limited discussion of uncertainties
Overall Quality Determination[*]			Medium	1.9	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	NLM,. 2020. PubChem: 1,4-Dioxane: Downloaded 08/31/2020.
Data Type	Databases Not Unique to a Chemical
Hero ID	6833554

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Sampling Methodology	N/A	N/A	No sampling was conducted for this database; referenced samples have sources cited with their own methodologies
	Metric 2:	Analytical Methodology	High	1	The analytical methods referenced are generally from widely accepted sources (e.g. OSHA, EPA, NIOSH)
Domain 2: Representative					
	Metric 3:	Geographic Area	High	1	When applicable, geographical information is reported - State drinking water guidelines
	Metric 4:	Temporal	High	1	data generally reflects current exposures - Data continues to be updated and dates are provided when there are multiple values for the same property
	Metric 5:	Exposure Scenario	High	1	When applicable, the information closely represents relevant exposure scenario
Domain 3: Accessibility/Clarity					
	Metric 6:	Availability of DB and Supporting Documents	High	1	Database is well known and accepted source; primary data is always referenced and link provide when applicable
	Metric 7:	Reporting Results	High	1	information in the database data is well organized and understandable by the target audience
Domain 4: Variability and Uncertainty					
	Metric 8:	Variability and Uncertainty	N/A	N/A	Key uncertainties, limitations, and data gaps are not discussed.
Overall Quality Determination[*]			High	1.0	
Extracted			No		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Gingell, R., Krasavage, W. J., Wise, R. C., Knaak, J. B., Bus, J., Gibson, W. B., Stack, C. R.. 1993. Toxicology of diethylene glycol butyl ether: 1 exposure and risk assessment. International Journal of Toxicology.
Data Type	Completed Exposure Assessment
Hero ID	68437

Domain	Metric	Rating†	Score	Comments‡
Domain 1: Reliability				
	Metric 1: Methodology	Medium	2	The assessment uses techniques that are from reliable sources and are generally accepted by the scientific community; however, a discussion of assumptions, extrapolations, measurements, and models is limited.
Domain 2: Representative				
	Metric 2: Exposure Scenario	High	1	Data closely represents exposure scenarios of interest.
Domain 3: Accessibility/Clarity				
	Metric 3: Documentation of References	High	1	References appear to be available for all reported data, inputs, and defaults
Domain 4: Variability and Uncertainty				
	Metric 4: Variability and Uncertainty	Low	3	Very limited discussion on uncertainties, limitations, and data gaps .
Overall Quality Determination*		Medium	1.8	
Extracted		Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
‡ The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Ecjrc,. 2002. European Union risk assessment report: 1,4-dioxane. 2nd Priority List.
Data Type	Completed Exposure Assessment
Hero ID	196351

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Methodology	High	1	Sound and acceptable methodology used in this assessment
Domain 2: Representative					
	Metric 2:	Exposure Scenario	High	1	Addressed consumer exposure from intentional use and unintential use (14D as impurity).
Domain 3: Accessibility/Clarity					
	Metric 3:	Documentation of References	High	1	References are publically available for all reported data
Domain 4: Variability and Uncertainty					
	Metric 4:	Variability and Uncertainty	Medium	2	limited discussion of uncertainties.
Overall Quality Determination[*]			High	1.2	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Makino, R., Kawasaki, H., Kishimoto, A., Gamo, M., Nakanishi, J.. 2006. Estimating health risk from exposure to 1,4-dioxane in Japan. Environmental Sciences.
Data Type	Completed Exposure Assessment
Hero ID	3660508

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Methodology	High	1	
Domain 2: Representative					
	Metric 2:	Exposure Scenario	High	1	
Domain 3: Accessibility/Clarity					
	Metric 3:	Documentation of References	High	1	
Domain 4: Variability and Uncertainty					
	Metric 4:	Variability and Uncertainty	Medium	2	Interindividual variability of exposure was addressed. Uncertainty factors were used in calculations but uncertainty was not discussed in detail.
Overall Quality Determination[*]			High	1.2	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Sapphire, Group. 2007. Voluntary Children"s Chemical Evaluation Program [VCCEP]. Tiers 1, 2, and 3 Pilot Submission For 1,4-Dioxane.
Data Type	Completed Exposure Assessment
Hero ID	3809038

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Methodology	High	1	Sound methodology
Domain 2: Representative					
	Metric 2:	Exposure Scenario	High	1	Children's exposure was estimated for a variety of pathways from contact with water, lotions, mother's milk, indoor air, cleaning materials. This represents exposure scenarios of interest.
Domain 3: Accessibility/Clarity					
	Metric 3:	Documentation of References	High	1	
Domain 4: Variability and Uncertainty					
	Metric 4:	Variability and Uncertainty	High	1	Uncertainties, variabilities, and data gaps were discussed.
Overall Quality Determination[*]			High	1.0	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	U.S. EPA,. 2005. Quantification of Exposure-Related Water Uses for Various U.S. Subpopulations.
Data Type	Completed Exposure Assessment
Hero ID	3809054

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Methodology	High	1	
Domain 2: Representative					
	Metric 2:	Exposure Scenario	Medium	2	The exposure scenarios (ingestion, inhalation, dermal contact) from water usage patterns are likely relevant to 1,4-D; although the report does not specifically address the chemical.
Domain 3: Accessibility/Clarity					
	Metric 3:	Documentation of References	High	1	
Domain 4: Variability and Uncertainty					
	Metric 4:	Variability and Uncertainty	High	1	
Overall Quality Determination[*]			High	1.2	
Extracted			Yes		

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[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Health, Canada. 2010. Screening assessment for the challenge: 1,4-Dioxane.
Data Type	Completed Exposure Assessment
Hero ID	3809085

Domain	Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability				
	Metric 1: Methodology	High	1	
Domain 2: Representative				
	Metric 2: Exposure Scenario	High	1	Discusses consumer exposure to household products.
Domain 3: Accessibility/Clarity				
	Metric 3: Documentation of References	High	1	
Domain 4: Variability and Uncertainty				
	Metric 4: Variability and Uncertainty	High	1	
Overall Quality Determination[*]		High	1.0	
Extracted		Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Danish EPA,. 2004. Survey of Chemical Substances in Consumer Products, No. 57 2005. Screening for health effects from chemical substances in textile colorants.
Data Type	Completed Exposure Assessment
Hero ID	3809099

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Methodology	Medium	2	Report states that methodology is similar to recommended methods by the EU, as described in the Technical Guidance Document (2003).
Domain 2: Representative					
	Metric 2:	Exposure Scenario	Medium	2	Exposure scenario for dermal, oral, and inhalation exposure to Danish children only.
Domain 3: Accessibility/Clarity					
	Metric 3:	Documentation of References	High	1	
Domain 4: Variability and Uncertainty					
	Metric 4:	Variability and Uncertainty	Low	3	No discussion of uncertainties, limitations, or data gaps.
Overall Quality Determination[*]			Medium	2.0	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	H. Willem, B. Singer. 2010. Chemical emissions of residential materials and products: Review of available information.
Data Type	Completed Exposure Assessment
Hero ID	4683373

Domain	Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability				
	Metric 1: Methodology	High	1	
Domain 2: Representative				
	Metric 2: Exposure Scenario	Low	3	US report. but a bit old report(> 5yrs) and no chemicals interest.
Domain 3: Accessibility/Clarity				
	Metric 3: Documentation of References	High	1	
Domain 4: Variability and Uncertainty				
	Metric 4: Variability and Uncertainty	High	1	
Overall Quality Determination[*]		High	1.5	
Extracted		No		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Danish EPA,. 2018. Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home.
Data Type	Completed Exposure Assessment
Hero ID	6302983

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Methodology	Medium	2	Limited discussion regarding assumptions, extrapolations, and models.
Domain 2: Representative					
	Metric 2:	Exposure Scenario	Medium	2	Exposure scenario represents inhalation exposure to epoxy floor paint. Concentrations were derived from chamber test conducted under one set of conditions.
Domain 3: Accessibility/Clarity					
	Metric 3:	Documentation of References	High	1	
Domain 4: Variability and Uncertainty					
	Metric 4:	Variability and Uncertainty	Medium	2	Limited discussion of key uncertainties, limitations, and data gaps.
Overall Quality Determination[*]			Medium	1.8	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	U.S. EPA,. 1987. National household survey of interior painters : final report.
Data Type	Survey
Hero ID	1005964

Domain		Metric	Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Data Collection Methodology	High	1	
	Metric 2:	Data Analysis Methodology	High	1	
Domain 2: Representative					
	Metric 3:	Geographic Area	High	1	
	Metric 4:	Sampling / Sampling Size	Medium	2	Medium, Sample size and methodology reported but sample size relatively small, error 6.9 percent
	Metric 5:	Response Rate	High	1	
Domain 3: Accessibility/Clarity					
	Metric 6:	Reporting of Results	High	1	
	Metric 7:	Quality Assurance	High	1	
Domain 4: Variability and Uncertainty					
	Metric 8:	Variability and Uncertainty	N/A	N/A	
Overall Quality Determination[*]			High	1.1	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	U.S, E. P. A.. 1987. Household solvent products: A national usage survey.
Data Type	Survey
Hero ID	1005969

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Data Collection Methodology	High	1	
	Metric 2:	Data Analysis Methodology	High	1	
Domain 2: Representative					
	Metric 3:	Geographic Area	High	1	Nationwide (U.S.A.) survey with outreach via random dialing and willingness to provide address and respond to survey.
	Metric 4:	Sampling / Sampling Size	High	1	
	Metric 5:	Response Rate	Medium	2	
Domain 3: Accessibility/Clarity					
	Metric 6:	Reporting of Results	High	1	
	Metric 7:	Quality Assurance	Medium	2	
Domain 4: Variability and Uncertainty					
	Metric 8:	Variability and Uncertainty	N/A	N/A	
Overall Quality Determination[*]			High	1.3	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	GEOMET Technologies,. 1995. Estimation of distributions for residential air exchange rates: Final report.
Data Type	Modeling
Hero ID	77171

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Mathematicl Equations	High	1	
	Metric 2:	Model Evaluation	Medium	2	Sought additional PFT measurement results (e.g., from recently completed studies) for areas with limited representation. Further compensation was obtained by applying weighting factors in the analysis.
Domain 2: Representative					
	Metric 3:	Exposure Scenario	Medium	2	>15 years old
Domain 3: Accessibility/Clarity					
	Metric 4:	Model and Model Documentation Availability	High	1	
	Metric 5:	Model Inputs and Defaults	High	1	
Domain 4: Variability and Uncertainty					
	Metric 6:	Variability and Uncertainty	High	1	
Overall Quality Determination[*]			High	1.3	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Walker, I. S., Forest, T. W., Wilson, D. J.. 2005. An attic-interior infiltration and interzone transport model of a house. Building and Environment.
Data Type	Modeling
Hero ID	3809002

Domain	Metric		Rating[†]	Score	Comments[‡]
Domain 1: Reliability					
	Metric 1:	Mathematicl Equations	High	1	Key mathematical equations are provided in detail
	Metric 2:	Model Evaluation	Medium	2	The two zone ventilation model was verified by comparing predictions to measured hourly averaged data. The level of peer review for this model is not known. It is from a published journal.
Domain 2: Representative					
	Metric 3:	Exposure Scenario	Medium	2	Article was published 15 years ago (2005); model does represent relevant conditions in exposure scenario
Domain 3: Accessibility/Clarity					
	Metric 4:	Model and Model Documentation Availability	Low	3	Equations and details about the calclulations are available in the published paper; unknown if a model outside of this paper exists that will automatically calculate these values.
	Metric 5:	Model Inputs and Defaults	Medium	2	Model inputs are provided but uncertain if they are standard to commonly accepted
Domain 4: Variability and Uncertainty					
	Metric 6:	Variability and Uncertainty	Medium	2	Uncertainty and variability were mentioned but not thoroughly discussed.
Overall Quality Determination[*]			Medium	2.0	
Extracted			Yes		

[†] High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
[‡] The overall rating is calculated as necessary. EPA may not always provide a comment for a metric that has been categorized as High.
[*] If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.

Study Citation:	Karlovich, B., Thompson, C., Lambach, J.. 2011. A Proposed Methodology for Development of Building Re-Occupancy Guidelines Following Installation of Spray Polyurethane Foam Insulation - Revision.
Data Type	Modeling
Hero ID	3809077

Domain	Metric		Rating†	Score	Comments‡
Domain 1: Reliability					
	Metric 1:	Mathematicl Equations	High	1	
	Metric 2:	Model Evaluation	Low	3	The paper does not provide information on the level of evaluation this model has received. It is clear that the author has conducted an evaluation (revisions); however, the level of peer review is unknown. Quality assurance was not discussed in detail.
Domain 2: Representative					
	Metric 3:	Exposure Scenario	High	1	
Domain 3: Accessibility/Clarity					
	Metric 4:	Model and Model Documentation Availability	Low	3	The methodology followed for this work has many similarities to the methodology that is described in the draft Center for the Polyurethanes Industry/Spray Polyurethane Foam Alliance SPF Insulation Emissions Testing Protocol. That protocol was the subject of a technical paper that was prepared for the 2008 CPI conference.
	Metric 5:	Model Inputs and Defaults	High	1	
Domain 4: Variability and Uncertainty					
	Metric 6:	Variability and Uncertainty	Medium	2	A commonly prescribed re-occupancy guideline in the SPF industry is 24 hours. The data developed for Bayseal OC and CC foams support this rule of thumb.
Overall Quality Determination*			Medium	1.8	
Extracted			Yes		

† High = 1; Medium = 2; Low = 3; Unacceptable = 4; N/A has no value.
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* If any individual metrics are deemed Unacceptable, then the overall rating is also unacceptable. Otherwise, the overall rating is based on the following scale: High: ≥ 1 to < 1.7; Medium: $=\geq 1.7$ to < 2.3; Low: $=\geq 2.3$ to ≤ 3.