Breastfeeding as a Predictor of Serum Concentrations of Per- and Polyfluorinated Alkyl Substances in Reproductive-aged Women and Children: A Rapid Systematic Review

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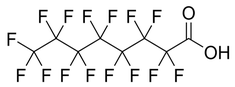
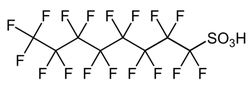
INTRODUCTION

- Per- and polyfluorinated alkyl substances (PFASs) are synthetic chemicals used for a range of manufacturing and industrial purposes[1,2]
- PFOA and PFOS are associated with poor health outcomes including developmental and reproductive effects[3,4]
- Major sources of human exposure to PFASs include diet[5], contaminated drinking water[6] and indoor house dust[7]
- Due to current and prior uses, PFASs are ubiquitous in the environment, widely detected in human serum[8-10] and breast milk[11,12]
- Lactation may be a potential excretion route of PFASs for women who breastfeed, and a source of exposure for infants[13-15]



Perfluorooctanoic acid (PFOA)



Perfluorooctane sulfonate (PFOS)

STUDY OBJECTIVE

The Navigation Guide

Specify the study question (PECO statement)

Study selection and data extraction

Risk of bias → Quality of evidence → Strength of evidence

To examine the association between breastfeeding and serum concentrations of PFASs - specifically PFOA and PFOS - among reproductive-aged women and young children using the Navigation Guide[3] systematic review methodology

Population: Reproductive-aged women (14-44 years) and young children (0-3 years)

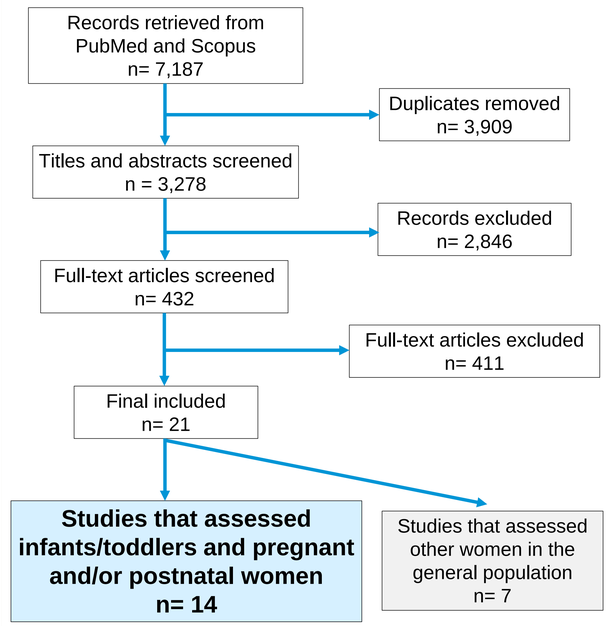
Exposure: Breastfeeding

Comparator: Women who did not breastfeed and children who did not consume breast milk

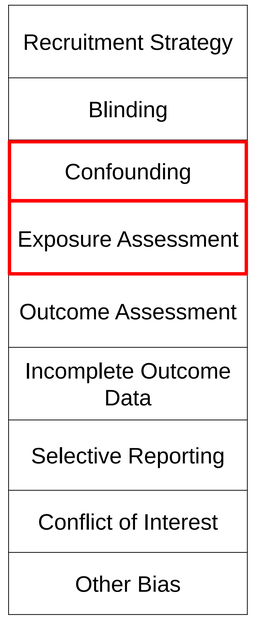
Outcome: Serum concentrations of PFASs (PFOA and PFOS of primary interest)

METHODS

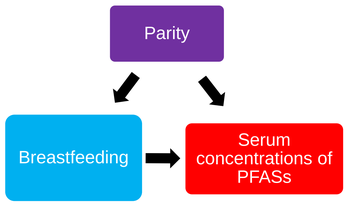
Study Selection



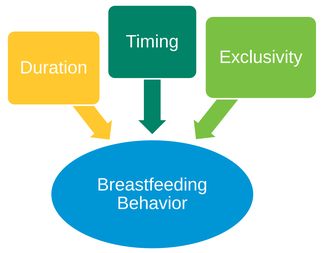
Risk of Bias Domains



Confounding by Parity



Exposure Variables

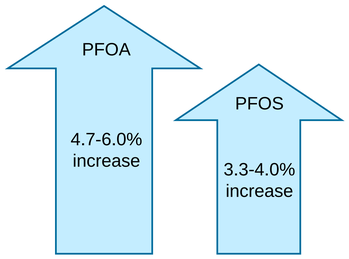


RESULTS

Table of Study Characteristics

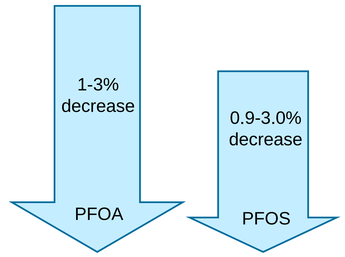
Population	Infants/Toddlers (n=5)	Pregnant and/or Postnatal Women (n=12)
Study Design	Cross-sectional (n=3), longitudinal (n=2)	Cross-sectional (n=9), longitudinal (n=3)
Sample Size	49-112 participants	19-1,645 participants
Location	United States (n=2), the Faroe Islands, Norway, and Germany	United States (n=3), Norway (n=5), Sweden (n=2), Germany, and Spain
Exposure Variable(s)	Duration (n=4), Exclusivity (n=2), Timing (n=1)	Duration (n=8), Exclusivity (n=3), Timing (n=2), Other (n=3)

Infants/toddlers



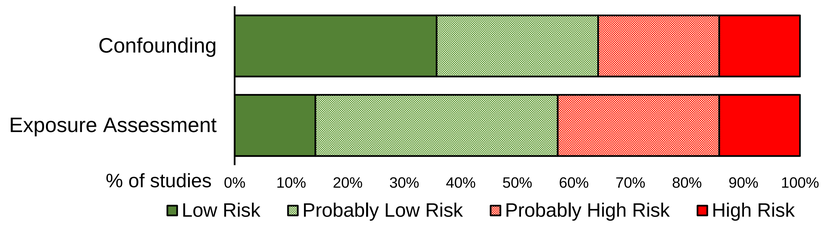
Higher serum PFASs per month of breastfeeding (p<0.05)

Pregnant and/or postnatal women



Lower serum PFASs per month of breastfeeding (p<0.05)

Risk of bias was rated **"probably low risk"** across all studies. The **confounding** and **exposure assessment** domains had the highest ratings due to lack of control for parity and inaccurate classification of exposure variables.



CONCLUSION

- **"Sufficient" evidence** for the association between breastfeeding and serum concentrations of PFASs among **pregnant and/or postnatal women**
- **"Limited" evidence** for **nursing infants/toddlers** due to small size of studies, and potential for confounding and exposure misclassification
- We found variability in exposure variables for breastfeeding across studies, as well as inconsistency in adjusting for parity and other confounding variables
- One limitation was the lack of information on whether bottle-fed infants/toddlers received formula made with PFOA-contaminated water
- **Breast milk is the optimal food for child health and development.** These results underscore the need to further reduce sources of human exposure to PFASs, particularly among these vulnerable populations
- The Navigation Guide methodology can be a useful tool to identify important determinants of environmental exposure

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