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# Patterns of persistent, bioaccumulative, and toxic pollutant co-contamination in marine and freshwater fish

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**Abstract:** The risk incurred from exposure to multiple contaminants in fish tissue is largely unknown due to a lack of understanding of toxicokinetic relationships and of the combinations of contaminants to which people are exposed. This knowledge gap could be detrimental to human health through possibly inadequate contaminant-specific fish advisories. The co-occurrence of various persistent, bioaccumulative, and toxic pollutants (PBTs) has not been systematically explored. In this study, we utilize the wealth of fish tissue data from available EPA datasets to quantitatively characterize the patterns of contaminant co-occurrence using a new approach called generalized joint attribute modeling (GJAM). This approach allows for the analysis of multivariate, multifarious data in a Bayesian framework. Resulting from this model is a joint distribution of response variables predicted by a combination of predictor variables, a corresponding coefficient matrix, and the covariance structure underlying the relationship among the response variables. Interpretation of this output will allow for the determination of factors driving co-occurrence and increase our ability to extrapolate risk profiles across large spatial scales. Preliminary results indicate that mercury is positively and weakly correlated with organic contaminants in coastal environments, but the opposite relationship is true in freshwater environments. Organic contaminants including chlordanes, dieldrin and polychlorinated biphenyls show a strong positive correlation in all systems. Important predictor variables for the prediction of co-occurrence include percent urban area within a watershed, trophic level of the fish, health at the base of the food chain, and total nitrogen in the water column.

***Keywords**:* mercury, fish tissue, multiple contaminant exposure, organic contaminants, GJAM