Exposure Disparities Within the Indoor Environment: Understanding Critical Pathways and Implications for Policy Responses

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Background and Objectives: Disparities in indoor environmental quality have not been fully incorporated into the dialog on environmental justice. Studies of the residential environment frequently ignore fundamental physical and chemical processes that drive exposure in these spaces, limiting efficient mitigation. This study explores these proximate (i.e., causal) determinants of environmental exposures and their relationships to observed disparities.

Methods: A review of the peer-reviewed literature on exposure disparities within indoor environments and potential driving forces was conducted. This evidence is placed in the context of physical and chemical models of indoor exposure dynamics to provide insight on the development of mitigation strategies.

Results: Exposure to lead, secondhand smoke and asthma triggers continue to disproportionately affect low socioeconomic status populations. Recent evidence highlights additional determinants of disparities in indoor environmental exposures, including: age of household furnishings, history of pesticide usage, product usage profiles, lack of mechanical ventilation in kitchens and bathrooms, and air infiltration pathways (multifamily setting). Physical models of emissions, dynamic partitioning, deposition, re-suspension and other critical processes can aid in the evaluation of risk-reduction strategies. Shared pathways (i.e., root causes) and disparities in susceptibility may also contribute to disproportionate cumulative risks.

Conclusion: Understanding specific physical and chemical pathways aids in the development of residential interventions that may reduce disparities. The persistence of some chemical residues may contribute to a "legacy" effect within older housing stock. These linkages will become increasingly relevant in buildings where energy-saving retrofits or weatherization efforts, motivated by climate change benefits, may reduce air exchange rates.