Human exposure to indoor pollutant concentrations is receiving increasing interest in Life Cycle Assessment (LCA). We address this issue by incorporating an indoor compartment into the USEtox model, as well as by providing recommended parameter values for households in four different regions of the world differing geographically, economically, and socially. With these parameter values, intake fractions and comparative toxicity potentials for indoor emissions of dwellings for different air tightness levels were calculated. The resulting intake fractions for indoor exposure vary by 2 orders of magnitude, due to the variability of ventilation rate, building occupation, and volume. To compare health impacts as a result of indoor exposure with those from outdoor exposure, the indoor exposure characterization factors determined with the modified USEtox model were applied in a case study on cooking in non-OECD countries. This study demonstrates the appropriateness and significance of integrating indoor environments into LCA, which ensures a more holistic account of all exposure environments and allows for a better accountability of health impacts. The model, intake fractions, and characterization factors are made available for use in standard LCA studies via www.usetox.org and in standard LCA software.