Potential Applications of Large Ensembles in the Assessment of Health Impacts of Climate Variability and Change

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Estimation of the observed and projected health impacts of climate variability and change has been an area of increasing focus in the environmental health community over the past two decades. Climate affects health through a range of pathways of varying directness, including changes in temperature, storms, air pollution, infectious diseases, and others. For some of these pathways, especially temperature and storms, impacts are driven by extremes, which are by definition rare events for which we have few observations. Also, there is increasing recognition that the joint occurrence of multiple extremes (e.g., heat, humidity, air pollution) may have especially large health impacts. To date, however, most health impacts work has been relatively unsophisticated in its use of climate projections, with most studies examining outputs of a single model driven by one or two emission scenarios. Recently, there has been an increasing use of ensembles from the CMIP archive for projections of future temperature-related mortality. This has led to better sense of the range of potential impacts, and presumably improved estimates of expected values. The emerging availability of large ensembles offers promise to expand the scope and relevance of health impact studies. This could aid in understanding the relative roles of forcing and natural variability in those impacts, the impacts of joint extremes, their evolution over time, and in the attributing observed health impacts to climate change per se. This paper will review applications to date of ensembles in health impact studies and suggest ways in which the climate science and health impact communities might work together to take maximal advantage of emerging large ensemble products.