

**Why some beat the heat while others do not. Understanding private (mal-)adaptation to heat waves based on the Protection Motivation Theory**

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Over the past decades heat waves have increased globally in frequency, intensity and duration. Although periods of extreme heat are responsible for more annual deaths than floods and storms combined, there is surprisingly little research on the socio-psychological factors that drive or impede households to adapt to unusual hot summertime temperatures. In contrast to most of the existing studies on heat waves that follow an ad-hoc approach, we choose a theory-driven attempt to explain private heat wave adaptation. To this end, we apply the Protection Motivation Theory (PMT), a theory that offers a comprehensive framework to explain protective behaviour and that has already been applied in various contexts of natural hazards. To further account for specific drivers of private adaptation to heat waves, we expand the PMT by health-related factors like personal susceptibility to heat or prevalence of cardiovascular diseases.

In this study, we use data from a telephone survey conducted in the urban agglomeration of Graz, Austria during the July 2015 heat wave, yielding a total sample size of 700 households. We run multiple regression analyses and structural equation models to test for significant effects of each latent factor according to the expanded PMT. Our results reveal the effect of perceived severity, health-related vulnerability, self-efficacy and response efficacy on households' intentions to maintain or improve physical well-being during heat waves. We compare low-cost, everyday practices (e.g. accessing green and blue recreational spaces) to mal-adaptive responses where individual courses of action yield personal benefits, but contradict societal goals (e.g. increased electricity consumption caused by A/C systems).

Our results are particularly relevant for future campaigns on heat wave risks and responses aiming to maintain thermal comfort and decrease heat-related morbidity and mortality among the general population. Detailed insights on the motives for adaptive behaviour allow risk communicators to craft risk messages more effectively and to better govern specific risk reducing actions. Insights on the extent and effectiveness of private protective action help to gauge complementary efforts by public authorities in order to reach an acceptable level of residual risk. Given the high mal-adaptive potential of certain response options, our results also caution risk managers against potential counter-productive outcomes of private autonomous adaptation.