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Social Impacts of Earthquakes on Health and Health Care Systems: Integrating Social Vulnerability in Systemic Seismic Vulnerability Analysis

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This paper discusses new approaches for modeling health impacts caused by earthquake damage. In current earthquake casualty estimation models, demand on healthcare systems is estimated by quantifying the number of fatalities and severity of injuries based on empirical data correlating building damage with casualties. The expected number of injured people (sorted by priorities of emergency treatment) is combined together with post-earthquake reduction of functionality of healthcare facilities such as hospitals to estimate the impact on healthcare systems. The focus here is to extend these models by developing a combined engineering and social science approach for quantifying impacts of earthquakes on health and healthcare systems.

Social vulnerability is multifaceted and complex and different approaches, concepts, and frameworks exist to analyse and describe it. Although social vulnerability is recognized as a key component of why a hazard becomes a disaster for some individuals, for social groups or for a whole community while others can cope with the event, social vulnerability models are seldom linked to common formal and quantitative seismic loss estimates of injured people which provide direct impact on emergency health care services. Yet, there is consensus that factors that affect vulnerability to post-earthquake health of at-risk populations include demographic characteristics such as age, gender, family structure, health and disability, occupation and employment can aggravate health impacts further. To link social impacts of health and health care services to a systemic seismic vulnerability analysis a conceptual model of social impacts of earthquakes on health and the health care systems has been developed. The healthcare model simulates households' decision-making and considers demographic, socio-economic and locational factors in addition to housing damage and lifeline loss to assess impact on health services beyond the number of casualties. To operationalize the conceptual model appropriate indicators from the EU Urban Audit Database have been selected to ensure harmonization with available data in a European context. Relevant vulnerability factors we identified by using principal component analysis. It is planned to validate these vulnerability factors deduced from the EU Urban Audit by applying the model in L' Aquila, Italy. The results will be used to develop a socio-physical model of systemic seismic vulnerability that enhances the further understanding of societal seismic risk by taking into account social vulnerability impacts for health and health care system, shelter, and transportation.