Geophysical Research Abstracts
Vol. 14, EGU2012-5930, 2012
EGU General Assembly 2012

Integrating Social impacts on Health and Health-Care Systems in Systemic Seismic Vulnerability Analysis

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This paper presents a new method for modeling health impacts caused by earthquake damage which allows for integrating key social impacts on individual health and health-care systems and for implementing these impacts in quantitative systemic seismic vulnerability analysis.

In current earthquake casualty estimation models, demand on health-care 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 health-care facilities such as hospitals to estimate the impact on healthcare systems. The aim here is to extend these models by developing a combined engineering and social science approach.

Although social vulnerability is recognized as a key component for the consequences of disasters, social vulnerability as such, is 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 a consensus that factors which affect vulnerability and post-earthquake health of at-risk populations include demographic characteristics such as age, education, occupation and employment and that these factors can aggravate health impacts further. Similarly, there are different social influences on the performance of health care systems after an earthquake both on an individual as well as on an institutional level. 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. We identified and tested appropriate social indicators for individual health impacts and for health care impacts based on literature research, using available European statistical data.

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.