



## **Societal and individual landslide risk to the population of Italy**

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Landslides cause damage to people every year in Italy. The number of fatalities (deaths and missing persons) and the number of casualties (deaths, missing persons, and injured people) are a direct, quantitative measure of the intensity of a disaster, and can be used to evaluate individual and societal risk quantitatively. Individual-risk criteria are expressed using mortality (or death) rates, which are given by the number of deaths per 100,000 people, in a given period. Societal-risk criteria are commonly established constructing frequency-consequences plots. In these plots, the number of losses (deaths, fatalities, or casualties) in each event is plotted versus the frequency of the event. Societal risk is then determined investigating the relationships linking the frequency of the events to their intensity, measured by the number of the losses. We have updated existing estimates of societal and individual landslide risk in Italy. For our assessment, we have used an improved version of the catalogue of historical landslide events that have resulted in loss of life, missing persons, injured people, and homelessness in Italy, from 1850 to 2008. This is the recent portion of a larger catalogue spanning the 1941-year period from 68 AD to 2008. This information was used to update the existing national estimates and to obtain first regional estimates of societal and individual landslide risk in Italy. To model the distribution of the frequency of landslide events with casualties in Italy, and in each of the 20 Regions in Italy, we adopted a Zipf distribution. We used the scaling exponent of the probability mass function (PMF) of the intensity of the events, which controls the proportion of small, medium and large events, to compare societal landslide risk levels in different geographical areas and for different periods. To consider the frequency of the events with casualties, we have scaled the PMF obtained for the individual Regions to the total number of events in each Region, in the period 1950-2008. We have used the results to rank societal landslide risk in the different Regions. For the same period, statistics on the number of people in Italy are available, for the 8102 individual Italian municipalities. By combining this information with the yearly number of landslide casualties, we have estimated the landslide death rates in each Region, for the period 1950-2008. For Regions where landslide risk was found particularly large, we have attempted a quantitative estimation of the total number of people exposed to landslide risk.