



Landslide risk to the population and its temporal and geographical variation in Italy

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In Italy landslide risk to the population is severe and widespread, people are frequently directly involved in landslide disasters. Quantitative landslide risk levels to the population can be evaluated establishing probabilistic levels of individual and collective risk. Using an updated version of the catalogue of landslide events with human consequences in Italy, we revised the existing estimates of individual and societal landslide risk, and we established new estimates using different territory subdivisions based on the physiographic settings and climatic conditions. To study individual landslide risk and its temporal and geographical variations, we determined landslide mortality rates, using the available Italian census data since 1861. To evaluate the mortality variation in time, we calculated the landslide average mortality rates for three different periods of fifty years each. Risk evaluation was performed for the Italian territory and for the five physiographic areas established by the Italian National Institute of Statistics (ISTAT) that classified the Italian municipalities on the basis of the average terrain elevation values, and of the distances to the seacoast. The estimates were also carry out considering different number of fatalities per event. Results show that the intensity of the events and the physiographic setting influence landslide mortality. In the examined period, the individual risk posed by low-intensity events has increased slightly in several areas in Italy. To determine societal landslide risk levels, we established the probability of experiencing severe landslide events modelling the empirical distributions of landslide harmful events with a Zipf distribution. To investigate the societal risk geographical variation, we analyzed the harmful events distribution in different morphometric subdivisions of Italy. This subdivision divides Italy into eight major physiographic provinces reflecting physical, geological, and structural changes of the Italian landscape. Zipf distribution parameters was estimated for each subdivision in the period 1861-2010. The same procedure was used to evaluate the societal risk levels for nine different climatic zones of Italy derived from the Köppen-Geiger climatic classification. Differences in the results allow us for some consideration concerning the influence of the climatic conditions and physiographic setting in the landslide risk to the population.