

STATISTICAL MODELING OF THE BEGINNING AND END OF RELIEF TIME BY RED CRESCENT IN EARTHQUAKES BETWEEN 1395 AND 1396: A SURVIVAL STUDY

Batoul KHOUNDABI

*Ph.D. in Biostatistics, Assistant Professor, Iran Helal Institute of Applied-Science and Technology (Red Crescent Society),
Tehran, Iran*

baharkhoundabi@gmail.com

Ahmad SOLTANI

Ph.D. in Disaster & Emergencies Health, Associated at Health in Emergency & Disaster Research Center Tehran, Iran

soltani.amd@gmail.com

Navvab SHAMSPOUR

Ph.D. Student in Educational Management, Head of General Education Department, Red Crescent Society, Tehran, Iran

navabshampour@gmail.com

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Earthquakes are considered a high catastrophic and unpredictable natural catastrophe and reports on structural collapses reveal a persistent vulnerability and emphasize the importance of better integration of collective response to such disasters. To alleviate the collapses and victims, there is a need to standardize all phases of USAR operations (deployment, search, locate, extrication, on-site medical support) and increase the speed of rescue efforts. Searching under the ruins of collapsed buildings is actually a fight against time, as time is strongly associated with the chances of survival of the entrapped victims. Survival under the building rubbles is strongly time-dependent and decreasing of the time between occurrence of a disaster (especially earthquake) and appearance rescue team will be helpful for low damages.

Since the beginning of 1395 to the end of 1396, a total of 85,550 incidents occurred in Iran, 314 of them were earthquakes which distributes differently in the provinces. According to the available information in this two-year period, 34% of earthquakes occurred in 1395 and 66% in 1396. An issue that is important at the time of the incident and especially about earthquake is the speed of operation and the optimal use of time in order to minimize casualties and save people life.

Investigating the effective factors on the duration between the start to the end of the relief effort, will be useful to improve crisis management for reducing wasting time and optimizing the management of future events.

In this paper, it has been tried to estimate the duration between the beginning and the end of the earthquake relief by some explanatory variables. It is used survival modeling like Cox regression or Kaplan–Meier to assessment and comparison of the effect of the explanatory variables such as: earthquake magnitude power, the amount of services provided by the Red Crescent society, level of health care and etc. For this research, the relief and rescue organization database has been used. A quantitative and qualitative comparison is made between two years 1395 and 1396. According to the results, 70 percent of earthquake happened in 4.0-4.9 power range. The median of time between start to end of relief operation is 4.6 hours. Cox model applying shows that power has significantly effect on the time of duration between start to end of relief operation and also the services like level of use of air and logistics services and the number of rescuer teams leads to shorter time significantly ($p < 0.05$). Log Rank test (Figure 1) distinguishes difference between time median in two years 1396 and 1395 ($p = 0.023$), this difference is due to different power of earthquake happened in these two years. The distance between two lines is increasing through the time that shows better relief in 1396 year. Advancing all these factors is the key for getting faster decisions and improving reaction times.



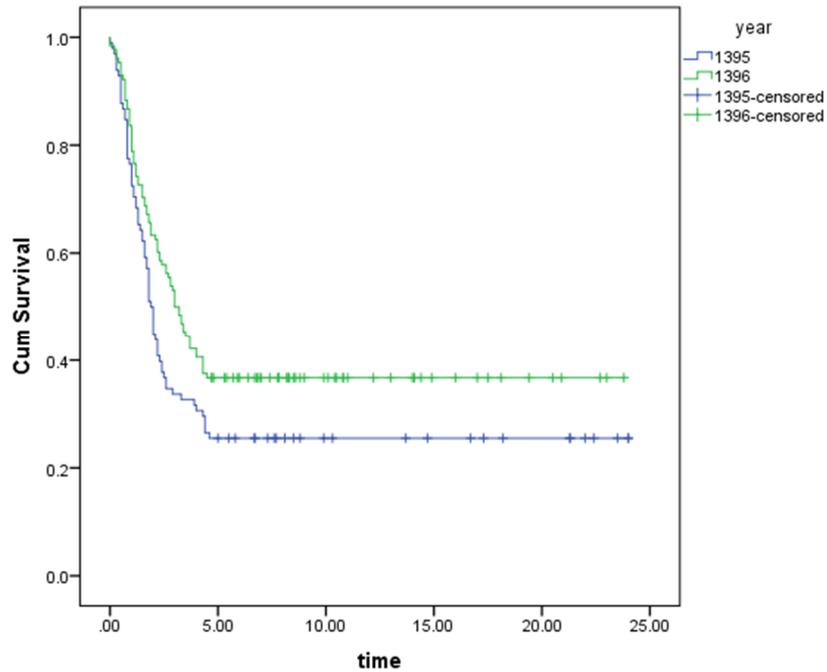


Figure1. Survival functions for time between start to end of relief operation.

REFERENCES

- Alexander, D.E. (2002). *Principles of Emergency Planning and Management*. Terra Publishing, Harpenden.
- Bartels, S.A., VanRooyen, M.J. (2012). Medical complications associated with earthquakes. *Lancet*, 379, 748–757.
- Jiu-ping, X.U. (2009). Meta-Synthesis Pattern of Analysis and Assessment of Earthquake Disaster System. *Systems Engineering - Theory & Practice*, 29(11), 1–18.
- Kleinbaum, D.G. & Klein, M. (2012). *Survival Analysis: A Self-Learning Text, Third Edition*. Springer, New York, NY.
- Relief and Rescue Organization database, <http://rarodmis.ir/hadese/admin/index.php>.