

## Age-dependent Mortality in the 2011 East Japan Earthquake -Further Revision of Traditional Mortality at Attack by Tsunami

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### 1. Preface

This paper reports a further development of known age-band specific mortality equation at attack by a tsunami. The equation in a certain age-bound has been written as

Mortality (%) = Number of deaths / Number of people concerned (1).

The equation looks therefore apparently simple enough. But, the reality is different from what we see in the equation, since the equation itself gives no special constraint. Incidentally, there come two essential issues to keep in mind at application.

The first one gives very low mortality for infants and children in case when a straight application of the equation is made to the 2011 giant tsunami, and on the contrary it gives very high mortality for aged people, which seems far illogical.

The second issue requiring careful treatment is how to fix the appropriate population concerned. Employing either prefectural or municipal census data with age-specific population by 5-year intervals is very convenient because of its easy accessibility, but we should be careful on whether or not those data are responsible for the real number of population attacked by a tsunami. As has already been criticized by Sawai<sup>1)</sup>, we should keep in mind of regulation of population to be suited to have direct comparisons in one event or in plural numbers of natural disasters as of earthquakes, tsunamis and, etc.

### 2. Methodology to overcome the above-stated two serious issues

In order to overcome the first issue we applied the Ozaki's method<sup>2)</sup> with a little modification. The essential point in his method is to give a special weight to a comparison of the mortality attacked by the natural disaster as tsunami, with that in one ordinary year during which no devastating disaster attacks. Thus we can get rid of any misunderstandings<sup>3)</sup>.

To overcome the second issue we finally adopted the outstanding outcomes by Koyama and her colleagues<sup>4)</sup> who succeeded counting of residents in the area inundated by the tsunami and in the area where their living houses were swept away. Since we have known by Hatori's work<sup>5)</sup> that the residents killed are mostly living in the swept-away houses, we placed higher priority on the number of residents living in the swept-away area.

### 3. Concluding Remarks

The finally obtained are summarized as in the followings.

- 1) For the mortality evaluation by the attack of tsunami, it is necessary to have a comparative study with the mortality in one ordinary year with no disasters.
- 2) Reasonable population at the mortality evaluation by tsunami is to count the number of occupants living in the swept-away houses by the tsunami.
- 3) We can evaluate the severity of mortality by tsunami just by ratio with one ordinary year with no significant disasters, and we are easy to understand that infants' mortality at attack by tsunami is far severer than that in one ordinary year.
- 4) In spite of the fact as in 3), in a few areas nearby Kamaishi city in Iwate Pref., we found the mortalities are relatively smaller, which suggests the effectiveness of special training frequently guided by Katada<sup>6)</sup>.
- 5) We have recognized a certain positive correlation between the derived

mortalities and tsunami heights.

#### References

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