What should constitute a baseline for measuring true global reductions in disaster casualties?

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ABSTRACT: The Sendai Declaration has set its disaster mortality goal on a 2005-2015 global baseline. Through a concentration of disasters, and by not reflecting pre-existing reductions in disaster mortalities, this baseline is biased (too high) to be representative of current global casualty rates. There is a 2/3 to 5/6 chance the Declaration will reach its mortality goal even without any further improvements in disaster casualties.

Paragraph 18a of the Sendai Declaration states:

a) Substantially … lower the average per 100,000 global mortality rate in the decade 2020–2030 compared to the period 2005– 2015.
- Is 2005-2015 a representative sample?
- Does the baseline also include pre-existing actions to reduce disaster casualties?
- What is the probability that the goal of Paragraph 18a could succeed or fail simply through chance alone?

Global Data set on Disaster Casualties
Considered complete back to 1970.

We can explore:
- How different hazards contribute
- How the statistics are dominated by a small number of high casualty disasters
- Any trends in hazard-specific casualty rates since 1970

Both for actual numbers and per 100,000 global population

Statistical Resampling

By assuming the record of high loss events is comprehensive, and that events are independent, we can resample event occurrence using 50,000 simulations to find the probability of achieving a certain number of casualties within a decade .

This can be done both while assuming no improvements in hazard specific disaster mortalities as well as after including the assumed improvements (see below).
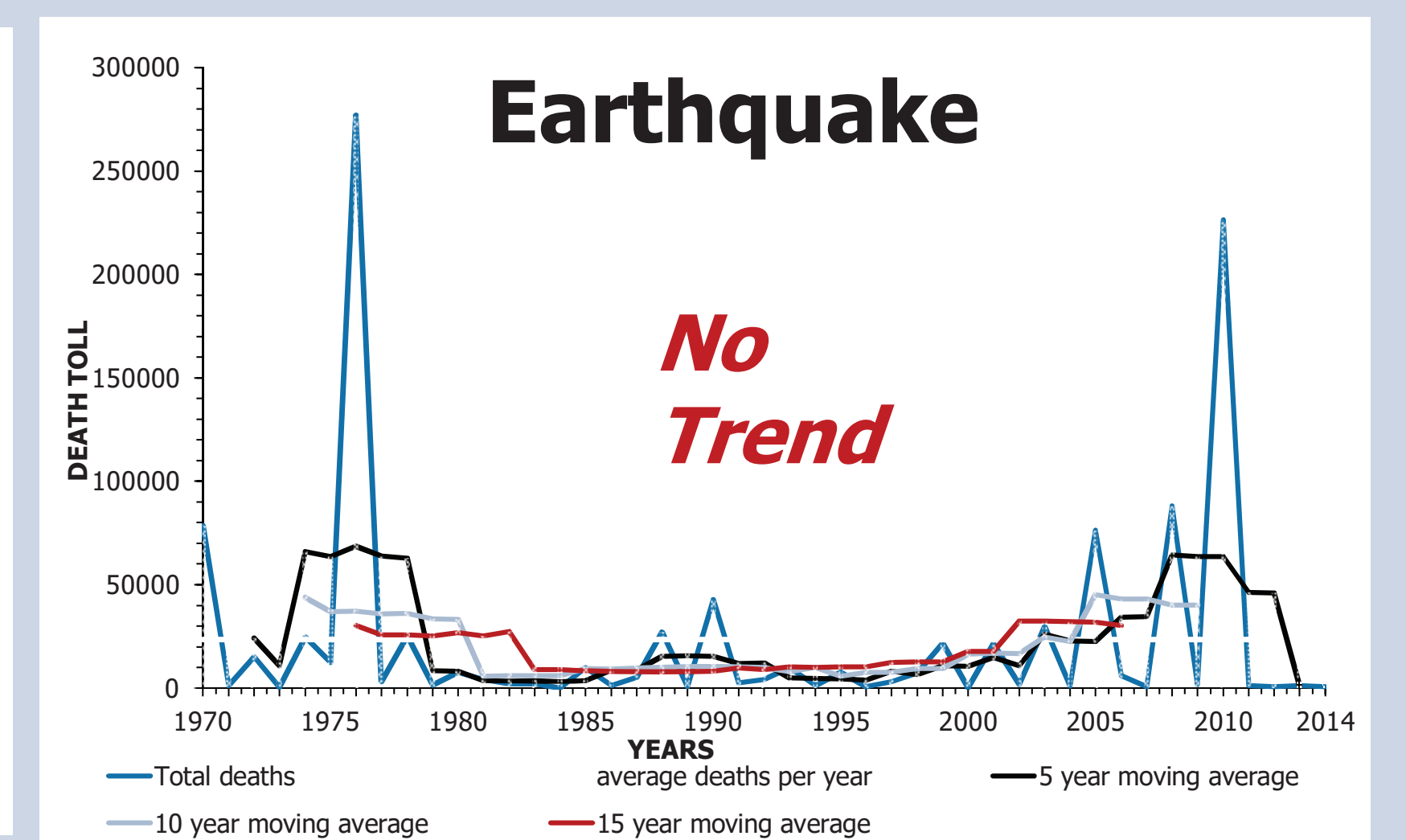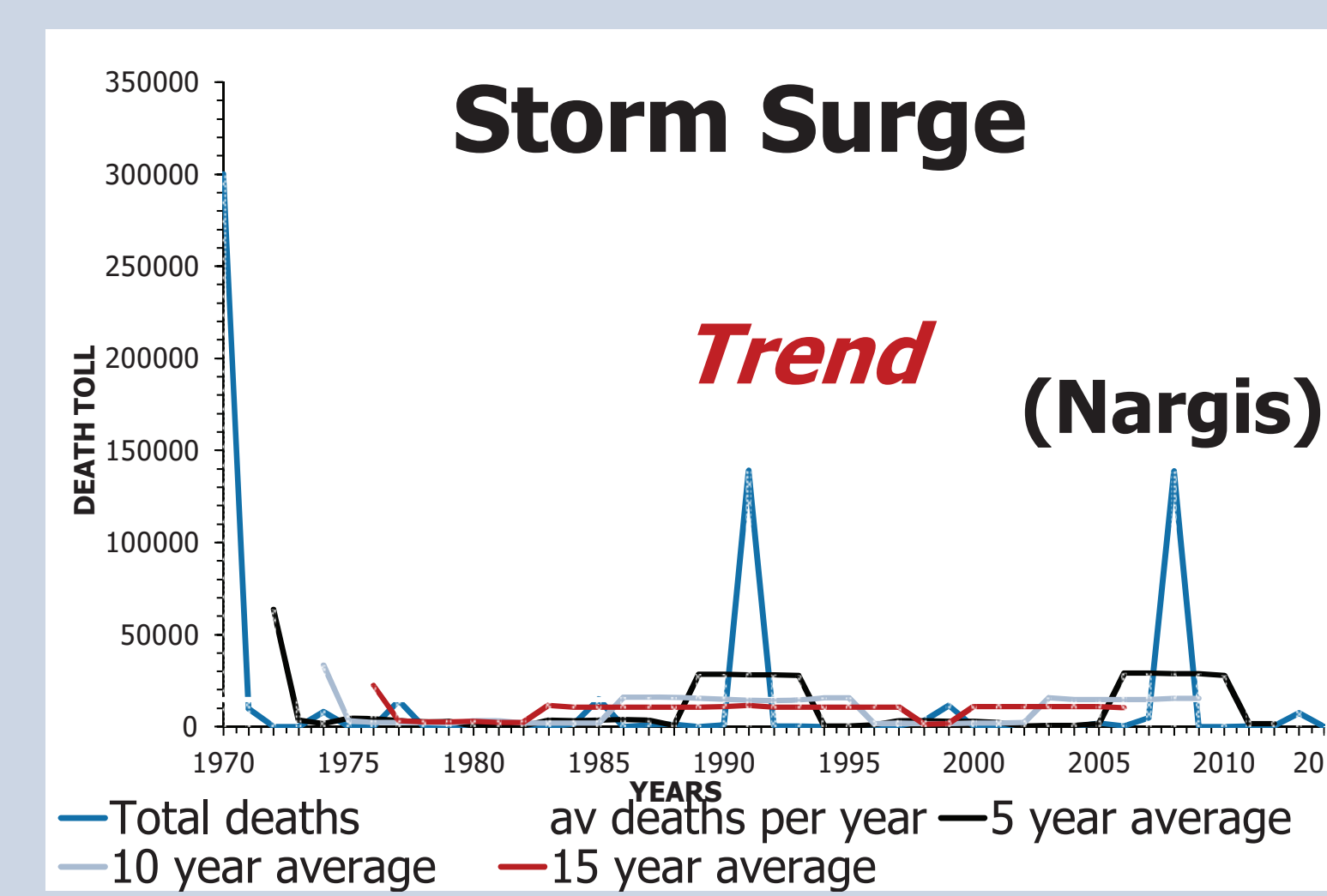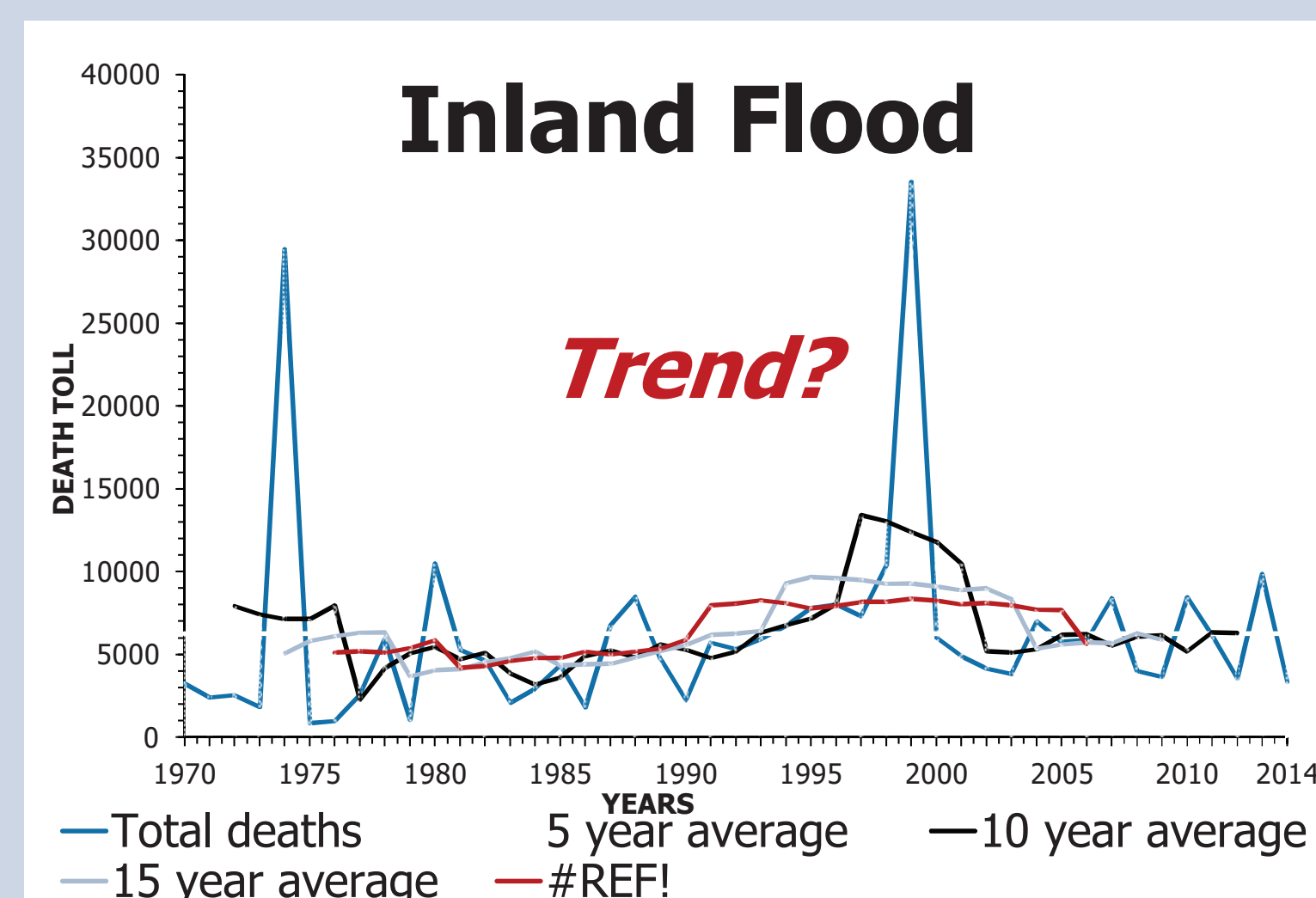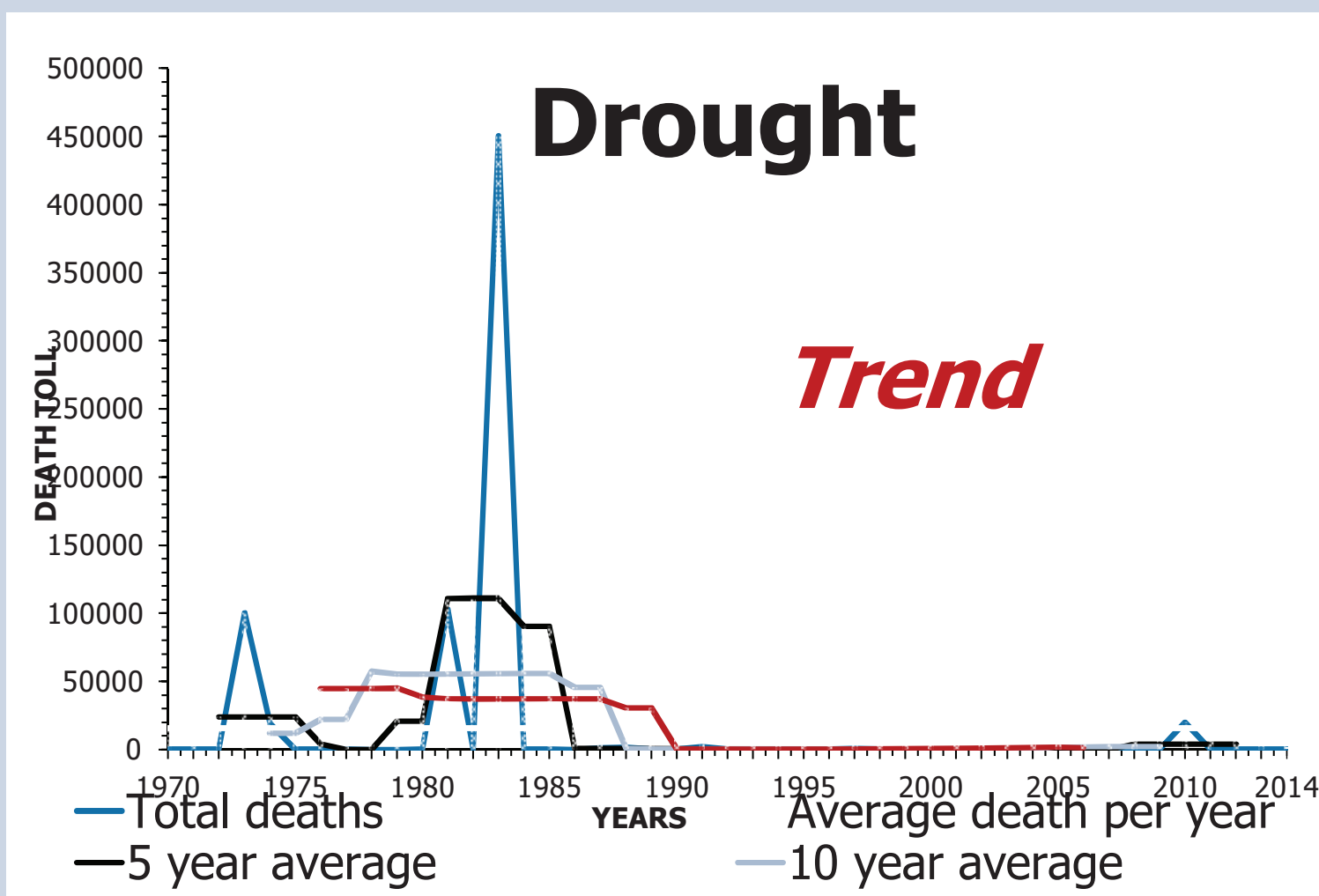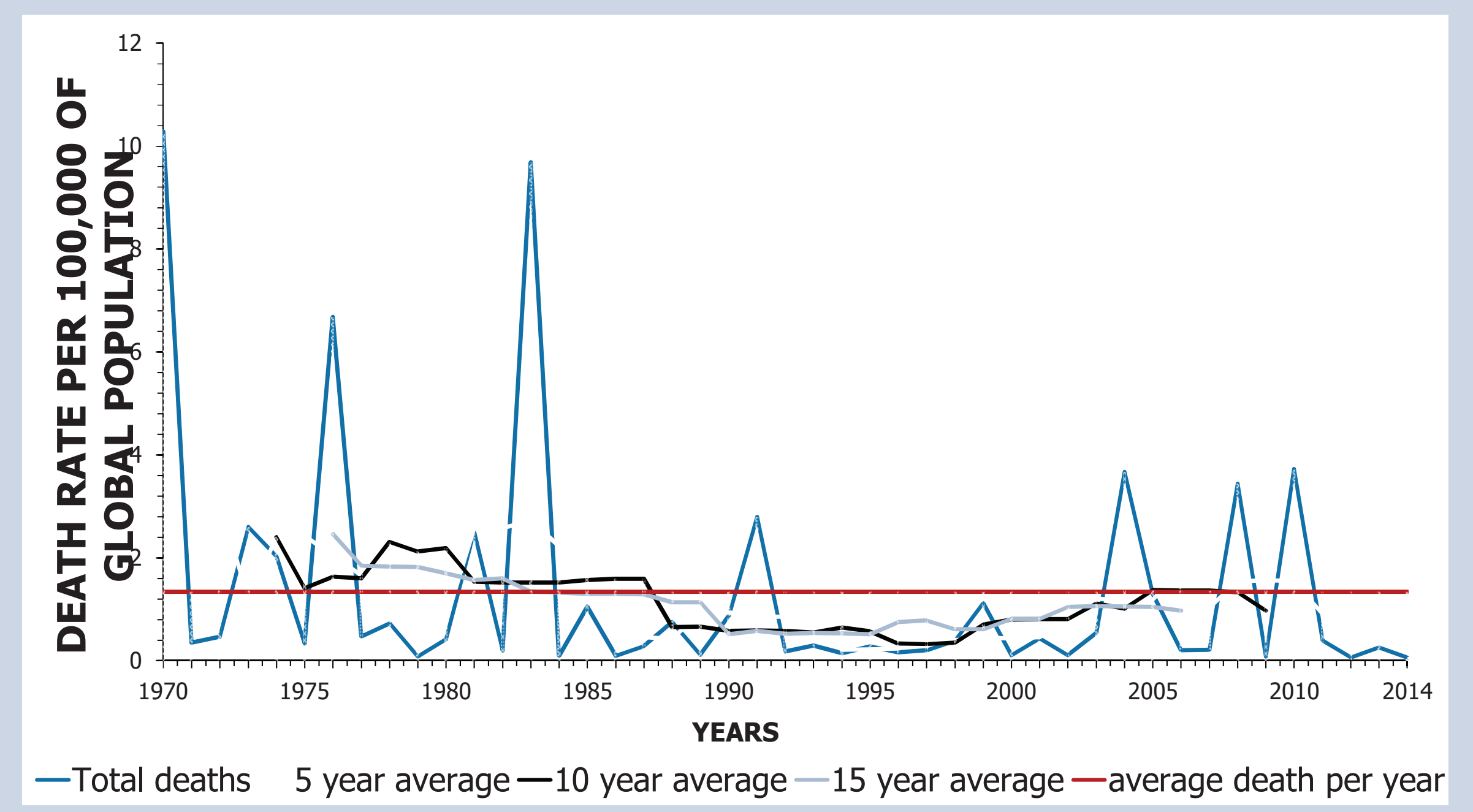
Annual death tolls from six principal hazards 1970-2015
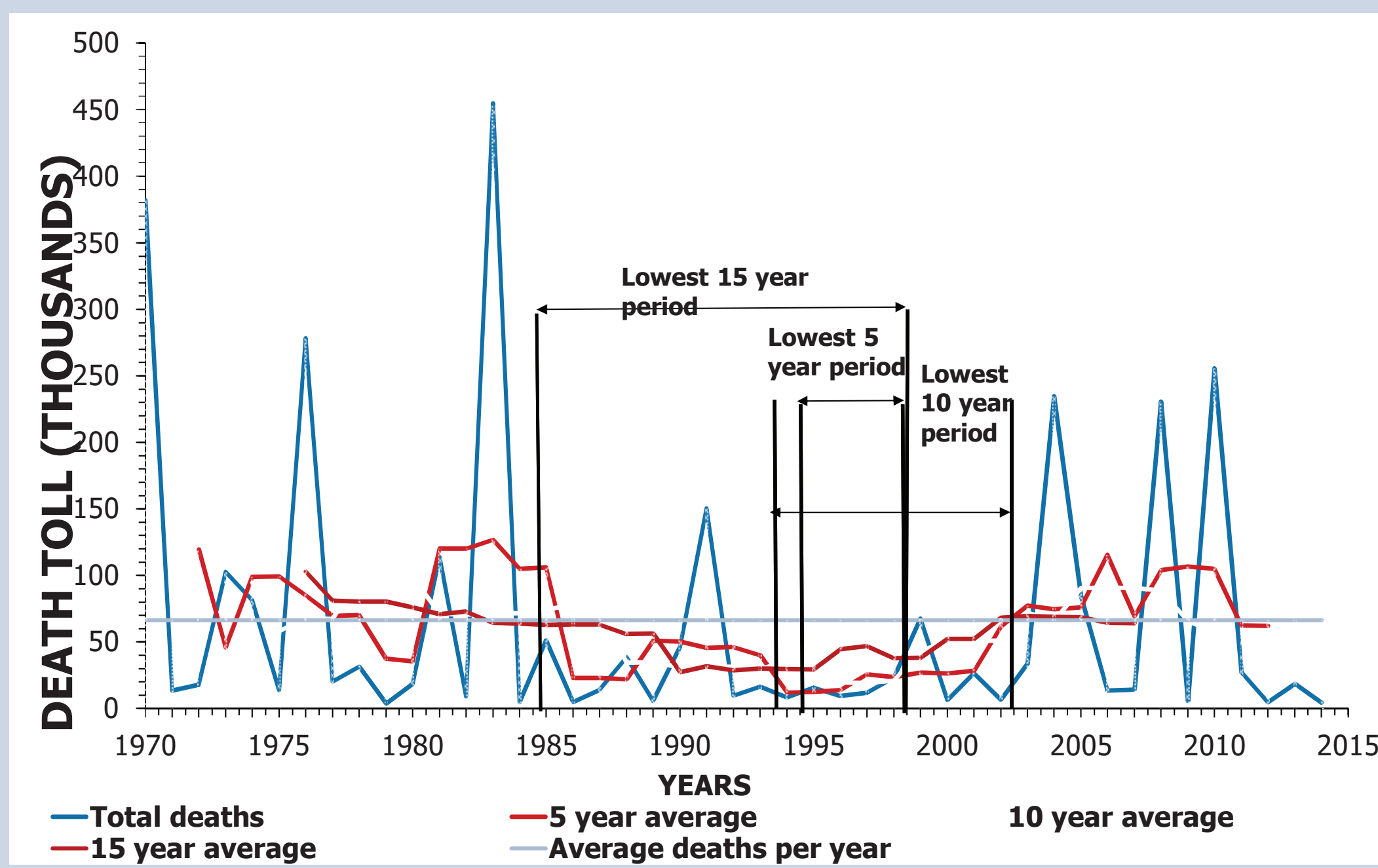
Proportion of deaths by hazard type: 1970-2015
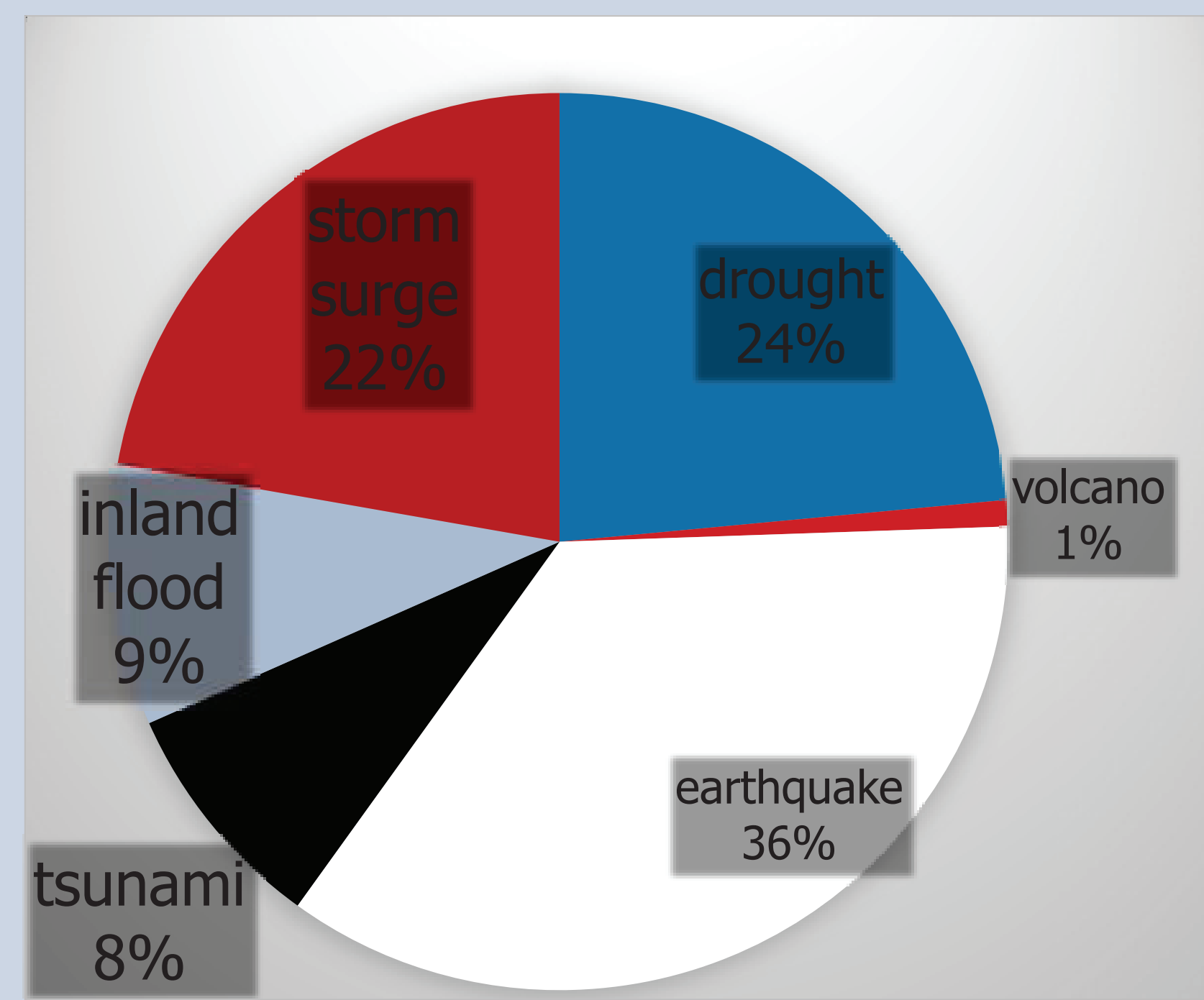
Annual death tolls per 100,000 population 1970-2015

Drought

Trend

Inland Flood

Trend?

Storm Surge

Trend (Nargis)

Earthquake

No Trend

'Optimistic' perspective on casualty reduction

- Volcano- reduce to 25% of 1970-2014
- Earthquake – no reduction.
- Inland Flood- reduce to 50% of 1970-2014 numbers.
- Storm surge – reduce to 25% of 1970-2014 numbers or 10,000 which ever is lower.
- Drought- reduce to 10% of 1970-2014 numbers or 10,000 which ever is lower.
- Tsunami- reduce to 25% of 1970-2014

Using 50,000 samples of decadal event occurrence
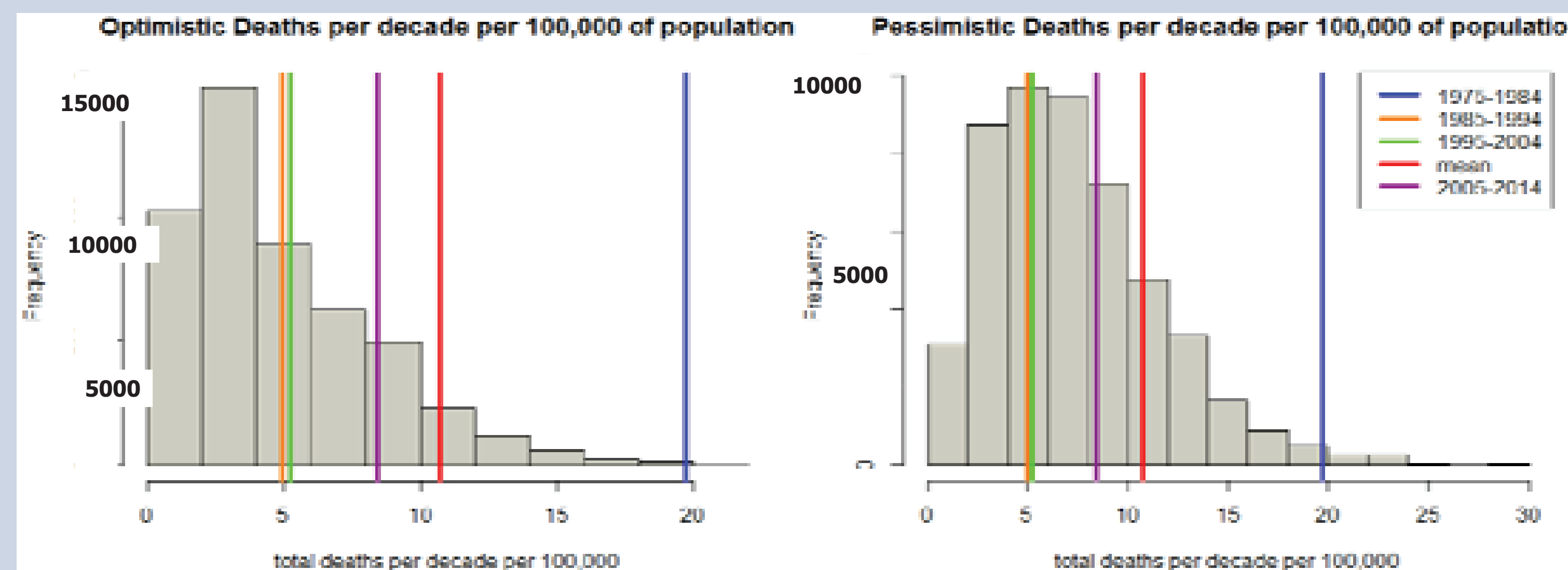
2005-2014 casualties are at 83rd centile

2005-2014 casualties are at 66th centile

'Pessimistic' perspective on casualty reduction

- Volcano – no reduction.
- Earthquake – no reduction.
- Inland Flood – no reduction
- Storm surge – reduce to 50% of 1970-2014 numbers for all except Nargis in Myanmar which is unchanged.
- Drought- reduce to 20% of 1970-2014 numbers.
- Tsunami – reduce to 50% of 1970-2014 numbers

- Based on the survey of data since 1970 the 2005-2014 period had unusually high disaster mortalities and is therefore not a good baseline from which to measure real improvements in global disaster casualties
- Significant reductions have already occurred in disaster casualties from drought, storm surge and tsunami prior to 2015, and these should be taken into consideration when setting a 2015 baseline.
- This study shows there is a 2/3 to 5/6 chance that the Sendai agreement would satisfy its disaster mortality reduction goal <u>by chance alone</u> without any further improvements in disaster mortalities.

Hiller, D(Oxfam); Dempsey,B (Save the Children). (2012). A Dangerous Delay- The cost of late response to early warnings in the 2011 drought in the Horn of Africa. *Joint Agency Briefing Paper*. 18th January.
Jongman, B; Winsemius, H.C; Aerts, J.C.J.H; Coughlan de Perez, E; van Aalst M.K; Kron, W; Ward,P.J (2015). Declining vulnerability to river floods and the global benefits of adaption. *Proceedings of the National Academy of Sciences*. 112 (18).
Muir-Wood R (2012) The use of catastrophe loss modelling methodologies to design and monitor disaster resilience goals and indicators in a Post-MDG framework. (RMS Report for the UK Department for International Development). 23p.
ftp://www.preventionweb.net/files/30181_30181catastrophelossmodellingan dds.pdf
Sheffield, J; Wood, E.F; Roderick, M.L. (2012). Little change in global drought over the past 60 years. *Nature*. 491 (15th November), 435-438.

- Any empirical measure - even using worldwide data - is going to suffer from volatility – so that a ten year sample is unlikely to be the true average
- The only way of removing this volatility is to use the synthetic 100,000+ year history in a catastrophe model, tuned to output casualties for a region or country
- First identified in Muir-Wood (2012) advocating a 50% reduction in modelled 'expected' disaster casualties over a decade.
- The modelled 50% reduction target has now been adopted by Tokyo City government for reducing earthquake casualties in the city.