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A Non-Monetary Global Measure of the Direct Impact of Natural Disasters

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Abstract: The standard way in which disaster damages are measured involves examining separately the number of fatalities, of injuries, of people otherwise affected, and the financial damage that natural disasters cause. Here, we propose a novel way to aggregate measures of disaster impact, which aims to overcome many of the difficulties previously identified in the literature. This new index is similar, but conceptually different, from the World Health Organization's calculation of Disability Adjusted Life Years (DALYs) lost from the burden of diseases and injuries (WHO, 2013). We convert all measures of impact into "lifeyears" units. After analyzing worldwide trends in lifeyears lost to disasters, we conclude with a very preliminary assessment of the likely impact, in lost lifeyears, of the current Ebola epidemic in the three most affected countries in West Africa.

Data used in this paper is available at:
https://sites.google.com/site/noyeconomics/research/natural-disasters

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1. Introduction

The standard way in which disaster damages are measured involves examining separately the number of fatalities, of injuries (if that data is available), of people otherwise affected, and the financial damage that natural disasters, such as earthquakes or floods, cause. This classification dates back to a 1970s UN-sponsored project, at the Economic Commission for Latin America and the Caribbean (ECLAC, 2003). It was further developed and refined, and is now referred to as the Damage and Loss Assessment Methodology (Guha-Sapir and Hoyois, 2012).

There are currently three databases on disaster costs with worldwide coverage: EMDAT, Sigma, and NatCat, but only EMDAT is publicly available, as the latter two are collected by the reinsurance industry (Sigma by SwissRe and NatCat by MunichRe). When examining the EMDAT data on damages — divided into mortality, morbidity, and financial losses — it is easy to notice that there is a stark difference between the trends indicated by each of these measures (figure 1).

This poses a problem for any attempt to characterize trends in disaster impact, and maybe more importantly, to utilize those trends to extrapolate into the future. One reason for forecasting future disaster impacts is to understand the implications of the current predictions about climatic changes on the frequency and intensity of natural hazards (IPCC, 2012). Other reasons that make understanding trends in disaster losses crucial is that the distribution of losses across regions and across countries at various levels of wealth and development is important, for example for the discussions on updating current climate change mitigation policy to include large international transfers of resources from the wealthiest industrialized countries to countries who are now rapidly growing (or want to grow). A careful cost-benefit analysis of various prevention and mitigation policies also necessitates a way to aggregate disaster losses.

Furthermore, even the cumulative trends shown in figure 1 aggregate events worldwide, so that the implicit assumption is that the value of a human life, and of a dollar worth of damages, is equivalent in all countries. While the first assumption is ethically convincing and intuitively appealing, the second one is undoubtedly more problematic.[1] It is difficult to disagree with the observation that financial resources are much more scarce in low-income countries, and therefore the monetary value of destroyed infrastructure does not have the same importance when comparing countries with different access to financial resources.

Here, we propose a novel way to aggregate measures of disaster impact, which aims to overcome some of the difficulties outlined above (and a few additional ones mentioned below). Our method here is similar, in some ways, to the World Health Organization's calculation of Disability Adjusted Life Years (DALYs) lost from the burden of diseases and injuries (WHO, 2013). As in the WHO's calculations of DALYs, our unit of measurement is also life-years. However, the one conceptual difference between the WHO's approach measuring the 'burden of disease' and our approach is that the DALYs measure the impact of diseases exclusively on health, while our measurement is aimed at accounting for the impact of disasters on human welfare more generally. Clearly, health is a major component of human welfare, but it is also obviously not the only one.

2. The Lifeyears Index

The basic premise is that the value of human life should ethically be considered as equal everywhere, while the value of monetary damages is not. Indeed, a dollar lost in the highest-income country in our dataset (Luxembourg) exerts less of an adverse impact on society than a dollar lost in the lowest-income country (Somalia). The ratio of per capita income in these two extremes is a staggering 708 (in 2010). The new index proposed here converts all damage indicators — including mortality, morbidity, other impacts on human lives (e.g. displacement), and damage to infrastructure and housing — into an aggregate measure of human lifeyears lost, an impact measure that does not use currency/monetary units.

The typical way to aggregate disaster damages is to attach a monetary value to human life (value of a statistical life: VSL). In the standard approach, a VSL is assumed to be a function of per capita income (P). The $VSL(P)$ function can take

[1] For further problems with the available data, see the recent discussions in Wirtz et al. (2014).

several forms, including the VSL remaining constant in P (i.e., equal value for the VSL across countries), or increasing in P (where lives in richer countries are valued more). Both approaches are found in this literature, the latter typically assuming a linear function such as: $VSL(P) = \alpha + \beta P$.[2] Typically, this method ignores the monetary value of injuries and of other direct human impact, and aggregates the mortality and monetary damage measures into an aggregate measure of disaster impact.[3]

Instead, we convert all measures of impact into "years of human life" units. Thus, monetary damages are converted to lifeyears units using a measure of per capita income). The monetary damages are Y, mortality M, the per capita annual income (or annual wage rate) is P. Using this notation, total damages (TD) in the standard calculation are thus, in monetary terms:

$$TD^{conventional} = Y + M \times VSL(P) \qquad (1)$$

In our approach we calculate the total years lost as

$$Lifeyears = L(M, A^{death}, A^{exp}) + I(N) + DAM(Y, P) \qquad (2)$$

where $L(M, A^{death}, A^{exp})$ is the number of years lost due to event mortality, calculated as the difference between the age at death and life expectancy. $L(M, A^{death}, A^{exp})$ thus requires not only information on the number of people who died, but also their age profile, and the projected life expectancy for that age/gender group. In global datasets, information about the age at death is not available. In our analysis we use the median age (A^{med}) instead of A^{death}.

For life expectancy, we follow the WHO's approach in measuring DALYs. The WHO uses a life expectancy of 92 years at birth ($A^{exp} = 92$). This number originates from projections made by the United Nations regarding the likely average life expectancy at birth in the year 2050 (WHO, 2013, p. 5). The rationale for using a high value for life expectancy, and one that is uniform across countries, is that the number represents a viable estimate of the possible frontier of human longevity in the

[2] See, for example, a recent calculation of VSL for Chile in Parada-Contzen et al. (2014).

[3] This method is used in evaluations of disaster risk reduction (DRR) projects. For example, Kunreuther and Michel-Kerjan (2013) use a wide range of values for VSL in their cost-benefit analysis of various DRR interventions, from USD 40,000 to USD 6 million; they assume an identical VSL across countries.

foreseeable future. Thus, our measure for the number of lifeyears lost due to disaster mortality is $L(M, A^{med}, A^{exp}) = M * (A^{exp} - A^{med})$.

$I(N)$ is the cost function associated with the people who were injured, or otherwise affected by the disaster. In principle, this should includes serious injuries, and the cost of their care, time spent in hospital and later rehabilitation, impact on people's mental health, impact on those whose houses were destroyed or livelihoods were adversely affected, impact on those who were displaced (temporarily or permanently), and any other direct human impact.[4] *N*, in this framework, is all the information available for each disaster that allows us to calculate, as closely as is possible, this component of the overall index. In most disaster cases, the complete information we require will be unavailable. For the global index proposed here, we use the EMDAT dataset, though it only includes information on the number of people affected. This count includes a wide range of syndromes and impacts. Following the WHO methodology in calculating DALYs, we assume that the impact function is defined as $I(N) = eTN^{EMDAT}$.

The coefficient, *e*, is the 'welfare-reduction weight' that is associated with being exposed to a disaster. There is no precedent to determining the magnitude of this weight, and there is much debate about the appropriate methodology to determine such weights (see the discussion about the 'disability weights' in determining DALYs; WHO, 2013, p. 11). We adopt the WHO's weight for disability associated with "generic uncomplicated disease: anxiety about diagnosis" (*e*=0.054).[5] *T* is the time it takes an affected person to return back to normality, or for the impact of the disaster to disappear; while N^{EMDAT} is the number of affected people as available in the EMDAT database. Our benchmark calculations are based on a three-year horizon for return to normality (*T*=3) but we also provide some sensitivity analysis using both shorter and longer horizons.

The last component of the index, $DAM(Y, P)$, attempts to account for the number of human years lost as a result of the damage to capital assets and infrastructure —

[4] See, for example, a report on forced displacement associated with disasters (IDMC, 2014).
[5] See, WHO (2013, p. 80) for the list of disability weights used in calculating DALYs.

including residential and commercial buildings, public buildings, and other types of infrastructure such as roads and water systems. In principle, we aim to measure the opportunity cost of spending human resources (effort) on the reconstruction of these destroyed assets. *Y*, the amount of financial damages usually indicated in information about disaster impacts, should therefore only include the value of the destroyed or damaged capital, rather than the cost of replacement.[6] *P* is the monetary amount obtained in a full year of human effort. We use income per capita (*PCGDP*) as an indicator of the cost of human effort, but discount this measure by 75% (*c*) in our benchmark calculations to account for the observation that much of our time is spent not in work-related activities. Thus, $DAM(Y,P) = {(1-c)Y}/{PCGDP}$.

Given the assumptions detailed above, our benchmark index is calculated as:

$$Lifeyears = M(A^{exp} - A^{med}) + eTN^{EMDAT} + {(1-c)Y}/{PCGDP}.$$

We use all the damage data available at EMDAT on disaster mortality, number of people affected, and overall monetary damages. EMDAT reports data for 221 countries and territories (see list in the appendix). We classify these into regions and income levels using the World Bank's classifications. Data on per capita GDP and the median age are taken from the World Bank's *World Development Indicators*, while data on life expectancy at the median age is taken from the World Health Organization's *Life Tables.*

3. Trends

The total number of lifeyears lost worldwide during the whole period of observation (1980–2012), using the assumptions outlined above, is 1,367 million lifeyears. This implies an annual average of almost 42 million lifeyears. This loss is similar to what the World Health Organization calculates were the DALYs associated with the global incidence of Tuberculosis in 2012 (WHO, 2014a).

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[6] The EMDAT dataset includes the amount of damage, rather than replacement costs, in other cases, the replacement cost needs to be discounted according to the likely ex ante remaining lifetime of the destroyed assets.

Figure 2 traces the evolution of global disaster impacts, measured in lifeyears. Two observations are immediately apparent: (1) There is no easily identifiable trend; any identified change over time is a function of the date at which the calculation begins, and the degree to which the very high volatility of this measure is smoothed out over time (more on that below). (2) Most of disaster impacts are experienced in Asia (East and South). This is, of course, also the most populated region, but the degree to which the region dominates the disaster impact measure is still striking. This dominance is likely due both to the region's high degree of exposure to a multitude of extreme events (especially wide-scale flooding), and to the high population density in the more exposed areas (the coasts along the Pacific and Indian Oceans and the major river systems).

A potentially more informative breakdown of the sample is across income levels; the motivation for this is the literature that identifies poverty as a significant determinant of disaster mortality (e.g. Kahn, 2005) and wealth as significant determinants of disaster damages (e.g. Raschky, 2008, Kellenberg and Mobarak, 2008). In figure 3, we observe that high-income countries account for a very small share of overall human years lost as a result of natural disasters (3.1% for 74 high-income countries). It is very apparent that much of the burden of these human losses indeed falls on countries with low incomes (16% for only 39 countries) and even more so on middle-income countries (80.9% for 107 countries).

This focus of disaster costs on the lower end of the income distribution spectrum is also apparent when lifeyears per capita are considered. Figure 4 plots the lifeyears per capita burden, over time, for the four income groups. The one noticeable difference is that low-income countries experience the highest per capita burden. We also observe that the annual peaks (the catastrophic rare events - henceforth Big-Sigma events) are important in shaping the trends for all but the high-income countries group.

By averaging across decades, we can smooth out some of the inter-annual variability that is so dominant in this data. This allows us to provide a better evaluation of trends over time. Figure 5 provides this analysis for the regional groupings; all regions, except for the Middle East and North Africa, have experienced an increase in the lifeyears lost due to disasters between the two periods under observation (1991-2001 vs. 2002-2012). The most significant relative change across decades, in American and the Caribbean, is associated with a specific event, the 2010 Haiti earthquake, but we still observe a trend increase for all other regions.

Figures 6 and 7 investigate the relative importance of the three components of the lifeyears index—mortality, affected, and damage to physical assets—in the different regions and income-groups. In figure 6, we observe that the regions that appear most important in the global aggregate summing of lifeyears lost, are also dominated by the measure of people affected. As can be expected, the share of lifeyears lost that is attributable to the physical asset losses is fairly small for all countries, except for the high income ones, and surprisingly even for these the share is about 40% (see figure 7).

3. Sensitivity

As noted earlier, the total number of lifeyears lost worldwide during the whole period of observation (1980–2012) is 1,367 million years. Table 1 investigates the sensitivity of our main assumptions. Table 1 includes variations of the number of days each individual was affected (calculated by varying the assumed length of time countries returned to normality and disasters' social impact dissipated) and the discount of the opportunity cost of monetary damages (from 50% to 85% discount). Clearly, the total count is sensitive to these assumptions, and more direct international evidence should determine which assumptions should be adopted for benchmarking purposes. It is possible that assessing specific events or countries necessitates using different assumptions. For example, countries for which the quality of infrastructure is lower (and therefore its lifetime) should use a lower discount rate than the one we use for our benchmark (75%), and similarly disasters where the people who were affected were impacted for a shorter duration because reconstruction was faster could use a lower day count.

We also modify our assumption that life expectancy is best represented by a uniform, cross-country, number (92). Instead, we obtain the contemporaneous life expectancy, in each country, of the median person (a representative person at the median age).[7] This modification only affects the mortality component of the lifeyears index, and is most relevant for low-income countries for which the difference between the assumed life expectancy (92), and the actual life expectancy (at the median age) is the largest. Overall, however, the impact of this modification is somewhat modest, decreasing the lifeyear's burden of disasters by a uniform 52.9 million lifeyears for the aggregate worldwide total for the whole sample period (this amounts to less than 4% decrease for our benchmark assumptions).

5. Big-Sigma events

As we discussed previously, the disaster losses we calculate are dominated by low-probability high-impact events (events whose costs are many standard deviations higher than the average cost for events included in the EMDAT dataset). Table 2 provides a list of the highest toll events, in each country, in each income group, and the top countries. Included are events whose toll is highest in absolute numbers (first column), and in per capita terms (second column). The only event that appears in both columns is the Haiti earthquake of 2010, which had both a very high impact in absolute terms, and relative to the size of Haiti (both in terms of population and incomes). As can be expected, the list of events in per capita terms is dominated by smaller countries, while the absolute one refers to well known events (the 2008 Sichuan earthquake, the Ethiopian famine of 1983) and wide-scale floods in China and India).

6. Final Discussion, and a Case Study of the Current Ebola Epidemic in West Africa

The approach proposed here has several attractive features, including: (1) a greater emphasis on the financial costs of disasters in low-income countries; (2) emphasis on the loss of human potential associated with disaster mortality; (3) emphasis on the tangible impact on people who were affected by disasters (but survived); (4) a full-information index, for specific disaster events for which the age and gender profile

[7] The data is calculated from the WHO's Life Tables for the year 2000 (about mid-way through our sample).

of deaths is available, will be decreasing with the age at death, thereby placing a higher emphasis on the death of children; and (5) perhaps most importantly, the fact that any of these assumptions can easily be modified, depending on the ultimate aim of the data analysis.

The measure proposed here focuses exclusively on the direct impact of disasters. There are significant socioeconomic impacts that are indirect in nature. Such indirect impacts can also be potentially long lasting (more discussion of this typology is available in Cavallo and Noy, 2011 and Meyer et al., 2013). Current knowledge appears to indicate that these impacts can indeed be long lasting (Cavallo et al., 2013), especially for the geographical areas directly impacted (e.g. duPont and Noy, 2014). We also know that the magnitude of indirect impacts may be a significant multiple of the direct impact.

Our quantification also ignored small but frequent disaster events such as local flooding that do not lead to mortality or large-scale damage (these are not included in the EMDAT database). These small events are prevalent, especially in poorer communities in poor countries, and have significant impact on human activity and the persistence of poverty.[8]

Furthermore, all existing measures of disaster impacts, including the one described here, do not account for the direct impacts that are more difficult to quantify, especially the effect on natural capital (e.g. on the natural environment and the ecosystem services it provides us). For all these reasons, our quantification here should be viewed as significantly underestimating the overall impact of disasters on human activity.

We conclude by demonstrating the use of our index in assessing specific events with a preliminary assessment of the cost, in lost lifeyears, of the current Ebola epidemic on the three most affected countries in West Africa—Guinea, Sierra Leone and Liberia. Table 3 includes assessment of three different scenarios regarding the

[8] The Desinventar database (http://www.desinventar.net/) aims to collect information also on these smaller events, but it coverage of countries and time is still too limited to allow it to be used in global measures of disaster imapcts.

spread of Ebola. In the first scenario, we assume a complete and immediate containment, so that the Ebola death toll is the amount of confirmed deaths due to Ebola as of the October 10, 2014 assessment by the WHO (WHO, 2014b). A second scenario assumes containment in early 2015 and therefore a death toll of 10,000 in these three countries. The third and most dire scenario assumes a slower containment in 2015 and consequently a much higher death toll of 100,000. These two more dire scenarios are based on assessment done by the World Bank, and the estimation of the economic damages from all three scenarios are also extracted from this report (World Bank, 2014). In estimating the number of affected people, we assume that all people residing in those provinces (in the three countries) that still have active and recently diagnosed cases were affected; while for the most dire scenario we assume the whole population in the three countries was affected. In the most optimistic scenario, 3.7 million lifeyears were already lost because of this epidemic, while the most pessimistic scenario we evaluate calculates a loss of 13.1 million lifeyears by the end of 2015. This sum lost in three very small countries is equal to about 1% of all lifeyears lost in all natural disasters worldwide in the past 33 years. Even the most optimistic scenario involves a loss of lifeyears in Liberia, Sierra Leone and Guinea, that is equivalent to all annual losses in all of Sub-Saharan Africa together.

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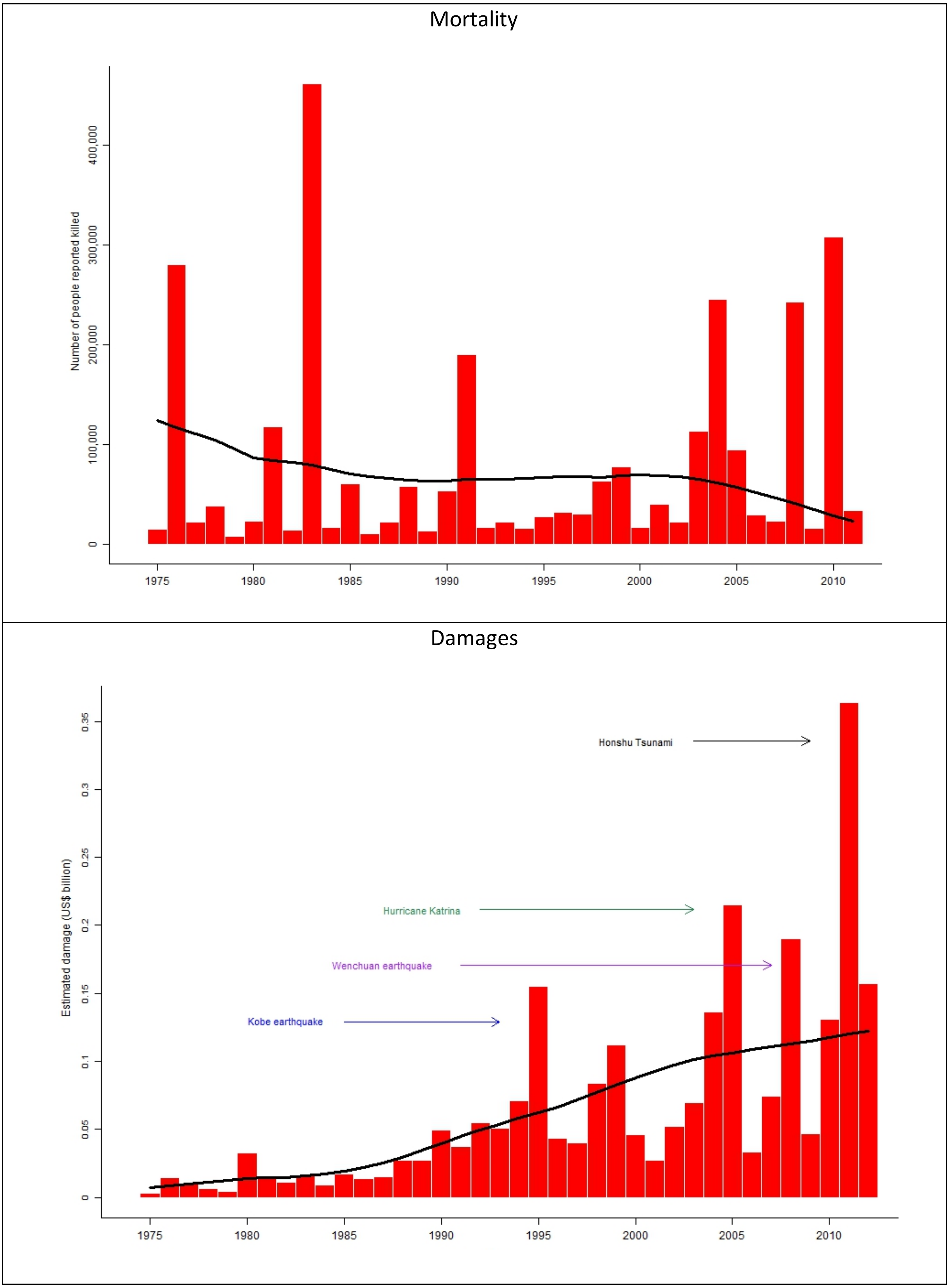
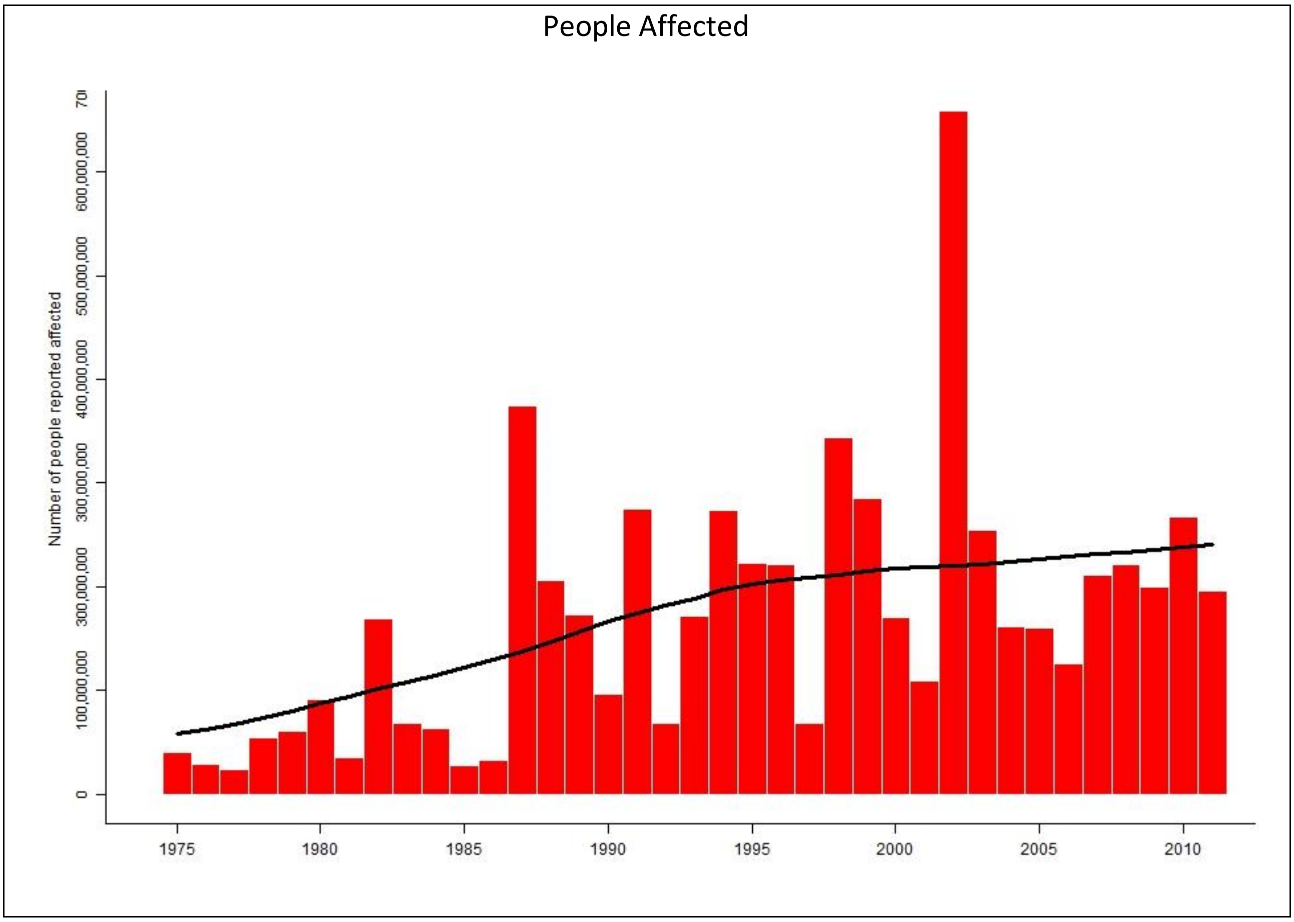
Figure 1: EMDAT on Trends in Mortality (top), Damages (middle) and Affected (bottom)





Source: EMDAT, www.emdat.be, Universite Catolique de Louvin, Belgium

Figure 2: Total lifeyears lost by regions

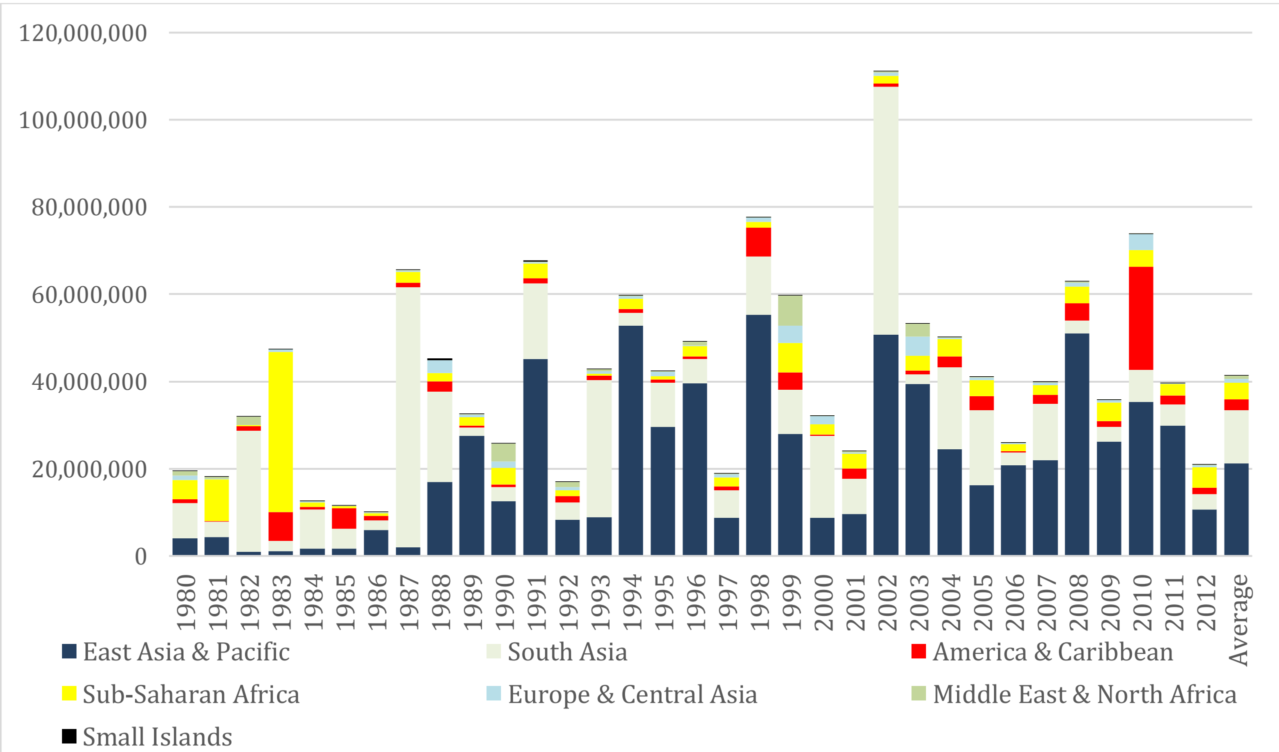


Figure 3: Share of lifeyears loss by income level

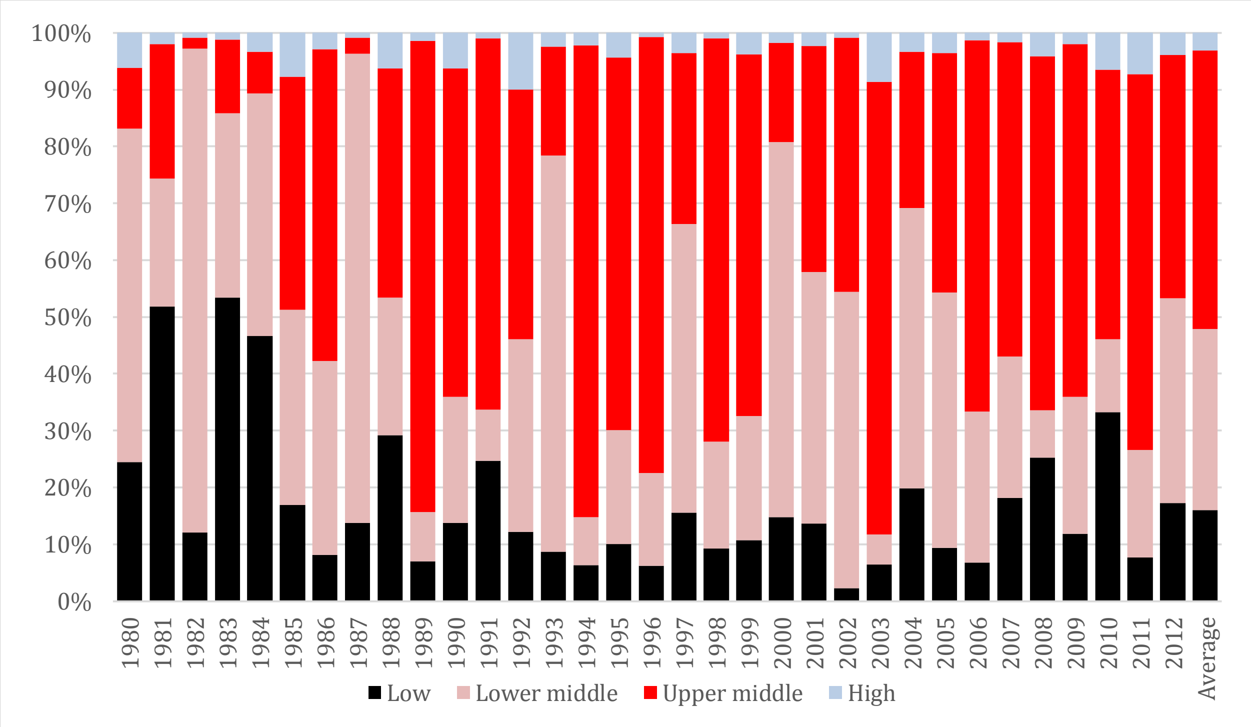
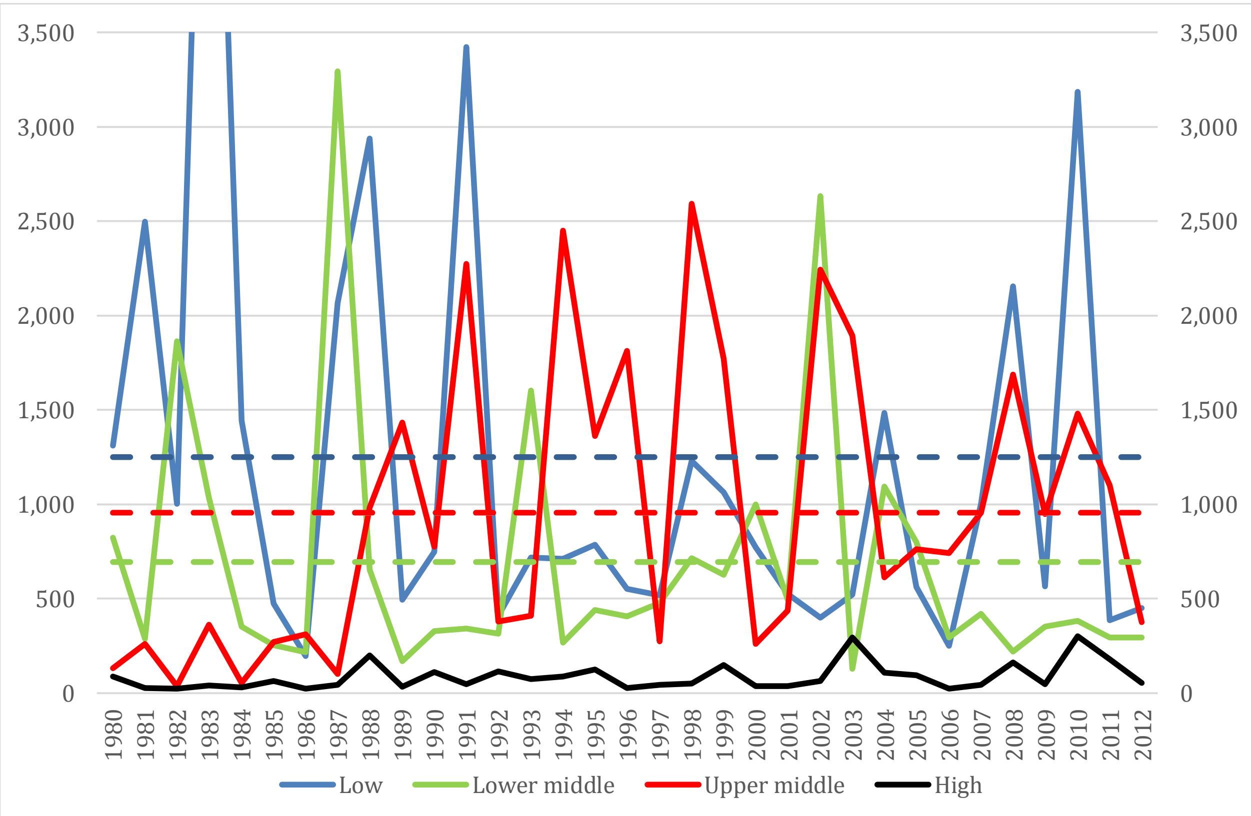


Figure 4: Lost lifeyears per 10^5 people by income level



The observation for low income in 1983 is 6,423.

Figure 5: Total lifeyears lost by regions over decades

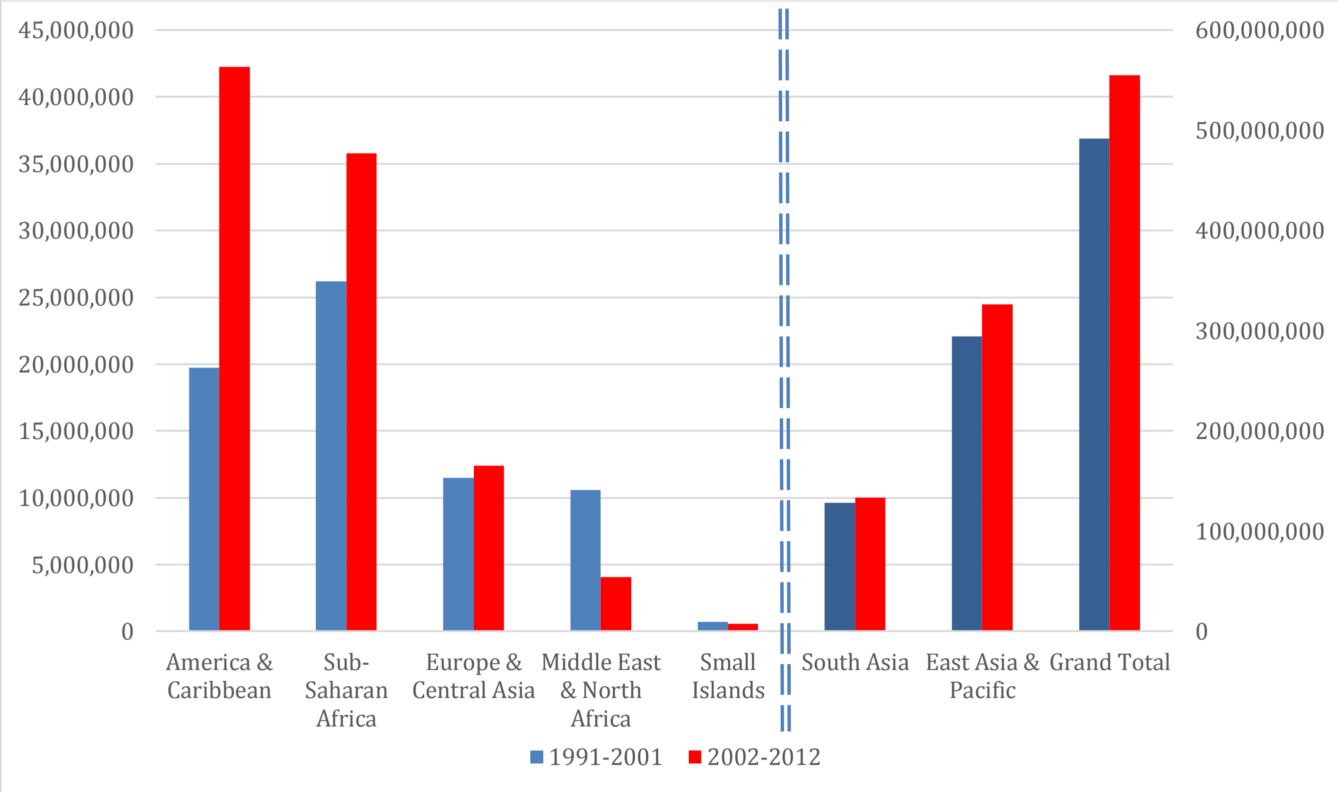


Figure 6: Share of lifeyears loss by cause, by region over the whole time period (1980-2012)

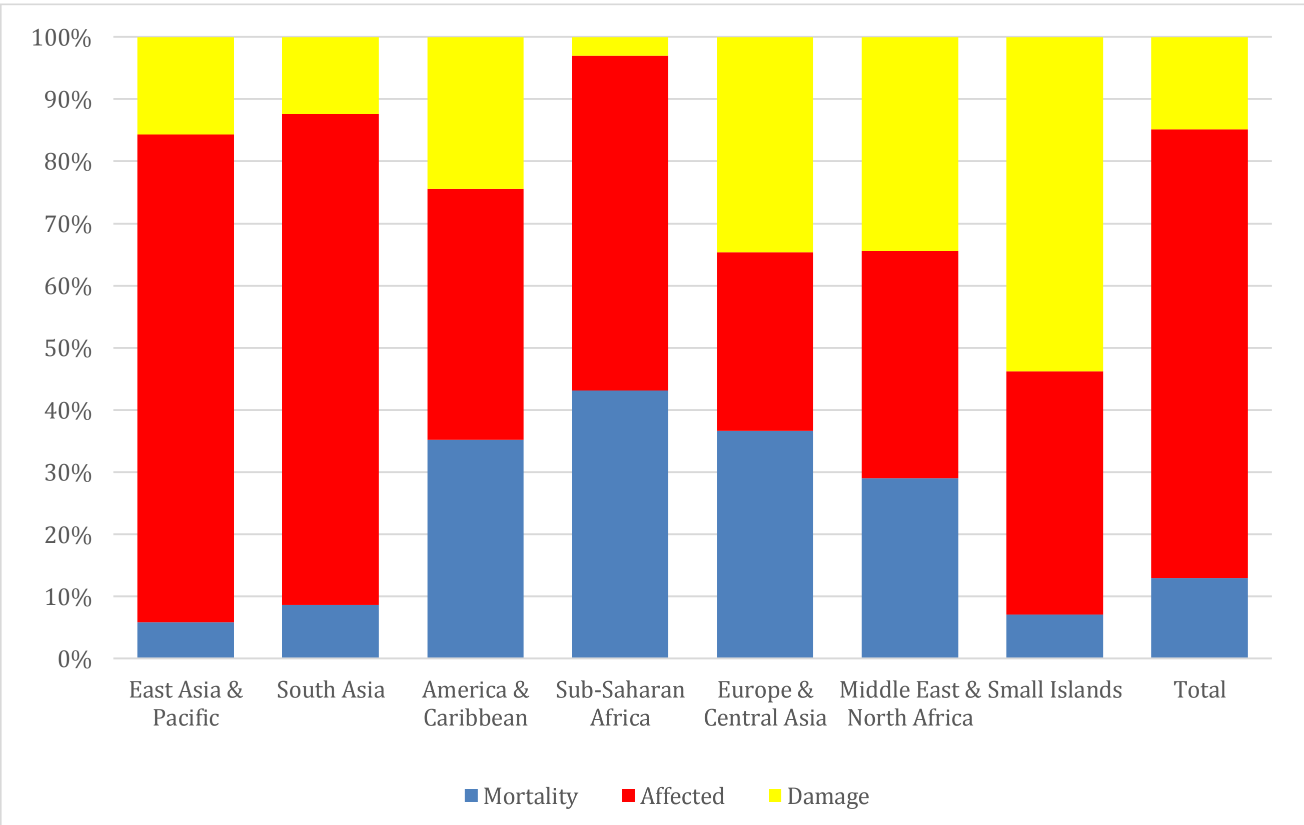


Figure 7: Share of lifeyears loss by cause, by income level over the whole time period (1980-2012)

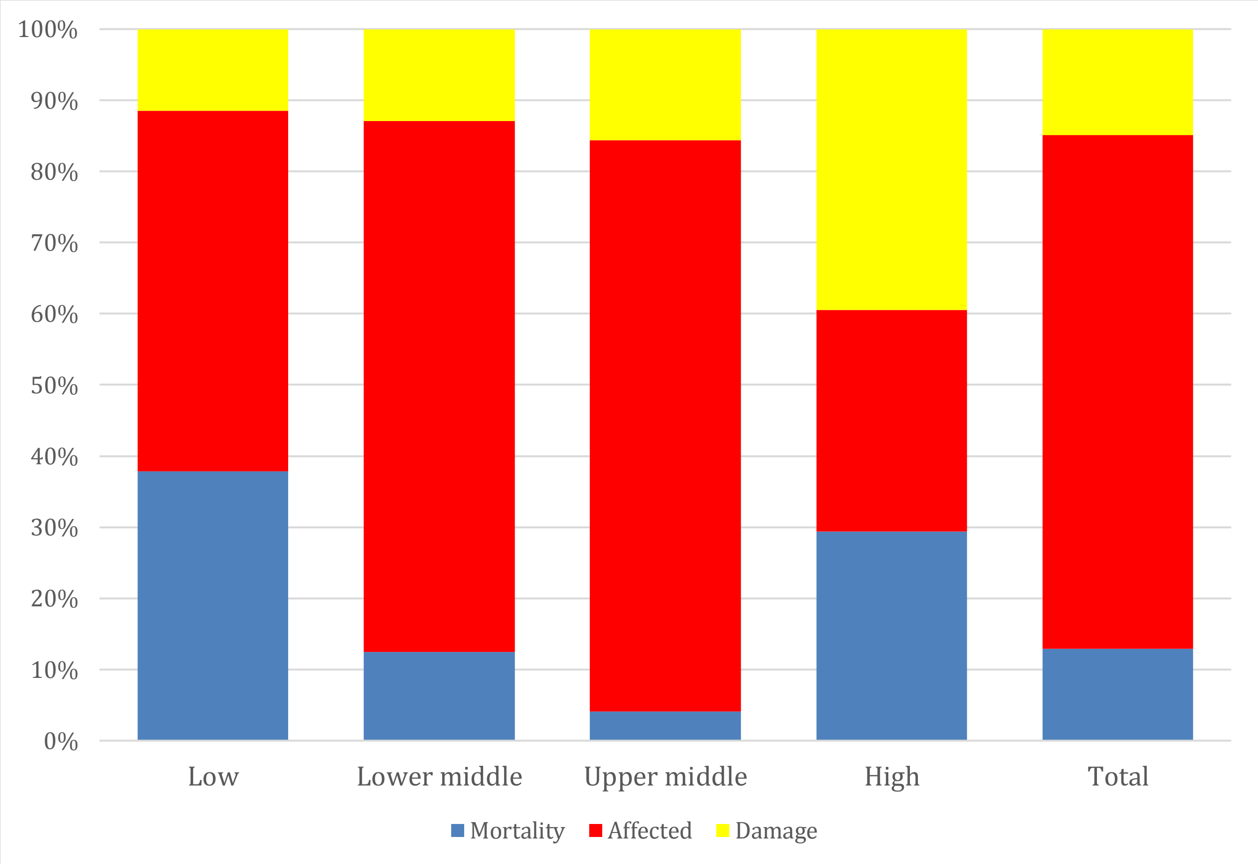


Table 1: Sensitivity of total lost lifeyears to index assumptions (in millions)

Years to normality	Days effected (d)	Discount for damages (c) (in precent) 85%	75%	65%	50%
1 Year	**20 days**	633.2	714.5	795.8	917.6
2 Years	**39 days**	951.2	1,032.5	1,113.7	1,235.6
3 Years	**59 days**	1,285.9	**1,367.1**	1,448.4	1,570.3
4 Years	**79 days**	1,620.6	1,701.8	1,783.1	1,905.0

The table calculates the total sum of lost lifeyears over the whole time period (1980-2012) by varying the assumed time it takes to return to normality and the discount parameter (c) for the monetary damages. The number of days per affected person (d) is calculated based on the number of years of return to normality multiplied by the 'disability weight' that the WHO uses for "generic uncomplicated disease: anxiety about diagnosis" when calculating Disability Adjusted Life Years (DALY) lost due to disease burden (weight is 0.054). The discounting of the monetary damages is necessary because of the difference between replacement and damaged assessments and the opportunity cost of devoting human effort for the reconstruction. Our preferred parameters are 59 days and 75%, and the estimated total for this set of assumptions is highlighted in red.

Table 2: The single costliest (Big Sigma) events
(in total and per capita years lost)

	Total human years lost	Per 10^5 people years lost
Region		
East Asia & Pacific	51,631,891	32,079
	(China, 1998)	(Mongolia, 1996)
South Asia	55,990,384	14,490
	(India, 2002)	(Sri Lanka, 2004)
America & Caribbean	20,902,245	211,211
	(Haiti, 2010)	(Haiti, 2010)
Sub-Saharan Africa	23,752,740	78,869
	(Ethiopia, 1983)	(Sudan, 1983)
Europe & Central Asia	3,165,995	16,024
	(Russia, 2010)	(Albania, 1989)
Middle East & North Africa	6,511,143	14,279
	(Iran, 1999)	(Yemen Arab Rep, 1982)
Small Islands	288,308	933,737
	(Jamaica, 1988)	(Montserrat, 1989)
Income group		
Low	23,752,740	342,286
	(Ethiopia, 1983)	(Niue, 2004)
Lower middle	55,990,384	78,869
	(India, 2002)	(Sudan, 1983)
Upper middle	51,631,891	93,607
	(China, 1998)	(St Lucia, 1988)
High	3,165,995	933,737
	(Russia, 2010)	(Montserrat, 1989)
Countries with the largest total count (1980-2012)		
China	586,505,983	
India	286,159,164	
Bangladesh	79,893,601	
Countries with the largest per capita count (1980-2012)*		
Montserrat		580,324
Niue		277,566
Haiti		228,284
* Calculated as the total count divided by 2012 population		

Table 3: Ebola in West Africa

Country	Deaths	Affected	Damage (000'USD)	Total lifeyears lost
I Lower-bound scenario: immediate containment				
Liberia	2,316	4,139,367	113,000	1,470,581
Sierra Leone	930	5,766,767	95,000	1,031,270
Guinea	778	6,974,242	120,000	1,242,619
II Containment in early 2015				
Liberia	5,755	4,139,367	179,000	2,095,208
Sierra Leone	2,311	5,766,767	222,000	1,174,100
Guinea	1,933	6,974,242	87,000	1,313,620
III Severe scenario - slower containment in 2015				
Liberia	57,555	4,294,077	300,000	6,677,378
Sierra Leone	23,111	6,092,075	602,000	2,904,128
Guinea	19,334	11,745,189	272,000	3,477,619

Median age in all three countries is 17; Life expectancy is assumed to be 92 (actual numbers are 70, 61, and 68). We use the benchmark assumptions of 59 days per affected person and 75% discounting for monetary damages. The death toll for scenario I is based on information from WHO (2014b), while the death toll for scenarios II and III is taken from the World Bank (2014) assessment, as do all the data on economic damages.

Appendix Table 1: Country information

Frequencies	Number of countries
South Asia	7
East Asia & Pacific	25
America & Caribbean	30
Sub-Saharan Africa	43
Europe & Central Asia	54
Middle East & North Africa	19
Small Islands	42
Low	39
Lower middle	52
Upper middle	55
High	74

Country	Region	Income Level
Afghanistan	South Asia	Low
Albania	Europe & Central Asia	Upper middle
Algeria	Middle East & North Africa	Upper middle
American Samoa	East Asia & Pacific	Upper middle
Angola	Sub-Saharan Africa	Upper middle
Anguilla	Small Islands	High
Antigua and Barbuda	Small Islands	High
Argentina	America & Caribbean	Upper middle
Armenia	Europe & Central Asia	Lower middle
Australia	East Asia & Pacific	High
Austria	Europe & Central Asia	High
Azerbaijan	Europe & Central Asia	Upper middle
Azores	Small Islands	High
Bahamas	Small Islands	High
Bangladesh	South Asia	Low
Barbados	Small Islands	High
Belarus	Europe & Central Asia	Upper middle
Belgium	Europe & Central Asia	High
Belize	America & Caribbean	Upper middle
Benin	Sub-Saharan Africa	Low
Bermuda	America & Caribbean	High
Bhutan	South Asia	Lower middle
Bolivia	America & Caribbean	Lower middle
Bosnia-Hercegovenia	Europe & Central Asia	Upper middle
Botswana	Sub-Saharan Africa	Upper middle
Brazil	America & Caribbean	Upper middle
Brunei Darussalam	East Asia & Pacific	High
Bulgaria	Europe & Central Asia	Upper middle
Burkina Faso	Sub-Saharan Africa	Low

Burundi	Sub-Saharan Africa	Low
Cambodia	East Asia & Pacific	Low
Cameroon	Sub-Saharan Africa	Lower middle
Canada	America & Caribbean	High
Canary Is	Small Islands	High
Cape Verde Is	Small Islands	Lower middle
Cayman Islands	America & Caribbean	High
Central African Rep	Sub-Saharan Africa	Low
Chad	Sub-Saharan Africa	Low
Chile	America & Caribbean	High
China P Rep	East Asia & Pacific	Upper middle
Colombia	America & Caribbean	Upper middle
Comoros	Small Islands	Low
Congo	Sub-Saharan Africa	Lower middle
Cook Is	Small Islands	Low
Costa Rica	America & Caribbean	Upper middle
Cote d\'Ivoire	Sub-Saharan Africa	Lower middle
Croatia	Europe & Central Asia	High
Cuba	America & Caribbean	Upper middle
Cyprus	Europe & Central Asia	High
Czech Rep	Europe & Central Asia	High
Czechoslovakia	Europe & Central Asia	High
Denmark	Europe & Central Asia	High
Djibouti	Middle East & North Africa	Lower middle
Dominica	Small Islands	Upper middle
Dominican Rep	America & Caribbean	Upper middle
Ecuador	America & Caribbean	Upper middle
Egypt	Middle East & North Africa	Lower middle
El Salvador	America & Caribbean	Lower middle
Equatorial Guinea	Sub-Saharan Africa	High
Eritrea	Sub-Saharan Africa	Low
Estonia	Europe & Central Asia	High
Ethiopia	Sub-Saharan Africa	Low
Fiji	Small Islands	Upper middle
Finland	Europe & Central Asia	High
France	Europe & Central Asia	High
French Guiana	America & Caribbean	Lower middle
French Polynesia	East Asia & Pacific	High
Gabon	Sub-Saharan Africa	Upper middle
Gambia The	Sub-Saharan Africa	Low
Georgia	Europe & Central Asia	Lower middle
Germany	Europe & Central Asia	High
Germany Dem Rep	Europe & Central Asia	High
Germany Fed Rep	Europe & Central Asia	High

Ghana	Sub-Saharan Africa	Lower middle
Greece	Europe & Central Asia	High
Grenada	Small Islands	Upper middle
Guadeloupe	Small Islands	High
Guam	East Asia & Pacific	High
Guatemala	America & Caribbean	Lower middle
Guinea	Sub-Saharan Africa	Low
Guinea Bissau	Sub-Saharan Africa	Low
Guyana	America & Caribbean	Lower middle
Haiti	America & Caribbean	Low
Honduras	America & Caribbean	Lower middle
Hong Kong (China)	East Asia & Pacific	High
Hungary	Europe & Central Asia	Upper middle
Iceland	Europe & Central Asia	High
India	South Asia	Lower middle
Indonesia	East Asia & Pacific	Lower middle
Iran Islam Rep	Middle East & North Africa	Upper middle
Iraq	Middle East & North Africa	Upper middle
Ireland	Europe & Central Asia	High
Israel	Middle East & North Africa	High
Italy	Europe & Central Asia	High
Jamaica	Small Islands	Upper middle
Japan	East Asia & Pacific	High
Jordan	Middle East & North Africa	Upper middle
Kazakhstan	Europe & Central Asia	Upper middle
Kenya	Sub-Saharan Africa	Low
Kiribati	Small Islands	Lower middle
Korea Rep	East Asia & Pacific	High
Kuwait	Middle East & North Africa	High
Kyrgyzstan	Europe & Central Asia	Lower middle
Lao P Dem Rep	East Asia & Pacific	Lower middle
Latvia	Europe & Central Asia	High
Lebanon	Middle East & North Africa	Upper middle
Lesotho	Sub-Saharan Africa	Lower middle
Liberia	Sub-Saharan Africa	Low
Libyan Arab Jamah	Middle East & North Africa	Upper middle
Lithuania	Europe & Central Asia	High
Luxembourg	Europe & Central Asia	High
Macau	East Asia & Pacific	High
Macedonia FRY	Europe & Central Asia	Upper middle
Madagascar	Sub-Saharan Africa	Low

Malawi	Sub-Saharan Africa	Low
Malaysia	East Asia & Pacific	Upper middle
Maldives	Small Islands	Upper middle
Mali	Sub-Saharan Africa	Low
Marshall Is	Small Islands	Upper middle
Martinique	Small Islands	High
Mauritania	Sub-Saharan Africa	Lower middle
Mauritius	Small Islands	Upper middle
Mexico	America & Caribbean	Upper middle
Micronesia Fed States	Small Islands	Lower middle
Moldova Rep	Europe & Central Asia	Lower middle
Mongolia	East Asia & Pacific	Lower middle
Montenegro	Europe & Central Asia	Upper middle
Montserrat	Small Islands	High
Morocco	Middle East & North Africa	Lower middle
Mozambique	Sub-Saharan Africa	Low
Myanmar	East Asia & Pacific	Low
Namibia	Sub-Saharan Africa	Upper middle
Nepal	South Asia	Low
Netherlands	Europe & Central Asia	High
Netherlands Antilles	Small Islands	High
New Caledonia	East Asia & Pacific	High
New Zealand	East Asia & Pacific	High
Nicaragua	America & Caribbean	Lower middle
Niger	Sub-Saharan Africa	Low
Nigeria	Sub-Saharan Africa	Lower middle
Niue	Small Islands	Low
Northern Mariana Is	East Asia & Pacific	High
Norway	Europe & Central Asia	High
Oman	Middle East & North Africa	High
Pakistan	South Asia	Lower middle
Palestine (West Bank)	Middle East & North Africa	Lower middle
Panama	America & Caribbean	Upper middle
Papua New Guinea	East Asia & Pacific	Lower middle
Paraguay	America & Caribbean	Lower middle
Peru	America & Caribbean	Upper middle
Philippines	East Asia & Pacific	Lower middle
Poland	Europe & Central Asia	High
Portugal	Europe & Central Asia	High
Puerto Rico	America & Caribbean	High
Reunion	Small Islands	High
Romania	Europe & Central Asia	Upper middle
Russia	Europe & Central Asia	High
Rwanda	Sub-Saharan Africa	Low

Samoa	Small Islands	Lower middle
Sao Tome et Principe	Small Islands	Lower middle
Saudi Arabia	Middle East & North Africa	High
Senegal	Sub-Saharan Africa	Lower middle
Serbia	Europe & Central Asia	Upper middle
Serbia Montenegro	Europe & Central Asia	Upper middle
Seychelles	Small Islands	Upper middle
Sierra Leone	Sub-Saharan Africa	Low
Singapore	East Asia & Pacific	High
Slovakia	Europe & Central Asia	High
Slovenia	Europe & Central Asia	High
Solomon Is	Small Islands	Lower middle
Somalia	Sub-Saharan Africa	Low
South Africa	Sub-Saharan Africa	Upper middle
South Sudan	Sub-Saharan Africa	Lower middle
Soviet Union	Europe & Central Asia	High
Spain	Europe & Central Asia	High
Sri Lanka	South Asia	Lower middle
St Helena	Small Islands	Low
St Kitts and Nevis	Small Islands	High
St Lucia	Small Islands	Upper middle
St Vincent and The Grenadines	Small Islands	Upper middle
Sudan	Sub-Saharan Africa	Lower middle
Suriname	America & Caribbean	Upper middle
Swaziland	Sub-Saharan Africa	Lower middle
Sweden	Europe & Central Asia	High
Switzerland	Europe & Central Asia	High
Syrian Arab Rep	Middle East & North Africa	Lower middle
Taiwan (China)	East Asia & Pacific	High
Tajikistan	Europe & Central Asia	Low
Tanzania Uni Rep	Sub-Saharan Africa	Low
Thailand	East Asia & Pacific	Upper middle
Timor-Leste	Small Islands	Lower middle
Togo	Sub-Saharan Africa	Low
Tokelau	Small Islands	Low
Tonga	Small Islands	Upper middle
Trinidad and Tobago	Small Islands	High
Tunisia	Middle East & North Africa	Upper middle
Turkey	Europe & Central Asia	Upper middle
Turkmenistan	Europe & Central Asia	Upper middle
Turks and Caicos Is	America & Caribbean	High
Tuvalu	Small Islands	Upper middle
Uganda	Sub-Saharan Africa	Low
Ukraine	Europe & Central Asia	Lower middle

United Kingdom	Europe & Central Asia	High
United States	America & Caribbean	High
Uruguay	America & Caribbean	High
Uzbekistan	Europe & Central Asia	Lower middle
Vanuatu	Small Islands	Lower middle
Venezuela	America & Caribbean	Upper middle
Viet Nam	East Asia & Pacific	Lower middle
Virgin Is (UK)	Small Islands	High
Virgin Is (US)	Small Islands	High
Wallis	Small Islands	Low
Wallis and Futuna Is	Small Islands	Low
Yemen	Middle East & North Africa	Lower middle
Yemen Arab Rep	Middle East & North Africa	Lower middle
Yemen P Dem Rep	Middle East & North Africa	Lower middle
Yugoslavia	Europe & Central Asia	High
Zaire/Congo Dem Rep	Sub-Saharan Africa	Low
Zambia	Sub-Saharan Africa	Lower middle
Zimbabwe	Sub-Saharan Africa	Low