Global approach for comparing the mortality rate from natural disasters and its relationship to the income level and development indices of the countries

Definitions;

- Disaster; A situation or event which overwhelms local capacity necessitating a request to national or international level for external assistance
1. Natural disasters (biological, geophysical, climatological, hydrological, meteorological)
2. Technological disasters (industrial accidents, transport accident, Miscellaneous
   - Disaster risk = hazard * vulnerability * exposure / capacity
   - Vulnerability (physical, environmental, structural, organizational, operational, economical,…)

- Mortality rate; is a measure of number of deaths because of specific cause or the general number of deaths of all causes, scaled to the size of that population in a specific time period. Which is reported as number per 1000 population in year.
- Socio economic status (income, consumption, wealth, education and occupation)
- Poverty (monetary dimensions of wellbeing, income and consumption and nonmonetary measurements)
- Income level (5 categories based on annual income)
- GINI index (distribution of income or consumption inequalities 0-100)
- HDI (life expectancy, education, and income 0-1)
- GDP per Capita (GDP/midyear population)

**How to measure income and wealth?**
- Income
  - Include many components such as: cash earnings, other cash market income (interest, dividends, etc.), cash transfers, other money income, realized capital gains and intermittent income, in-kind earnings and home production, imputed rent for owner-occupied dwellings, …
- Wealth
  - Include; Financial and non-financial assets and liabilities

Significance
- About 3.3 million people have been killed by earthquakes, storms and other hazards from 1970 to 2010. In other word the average of 82500 deaths worldwide per year
- Most of the 3.3 million deaths over the last 40 years were in poor countries. In poorer countries high poverty and unemployment rates, distributional inequalities, socioeconomic exclusion of the poor from basic services, strong population growth and lack of strong national and local institutions for

dealing with natural disasters contribute to vulnerability and the higher death rates.
- We can expect increasing the exposure level to cyclone and earthquake in large cities raise up to 1.5 billion people by 2050 comparing to the exposure level which was 680 million in 2000
- The annual average of the people killed from natural disasters from 2002 to 2011 was 107,000 and 124.5 million people become victims worldwide
- Floods and storms hit more than 60% in every region
- They accounted for more than 75% of all natural disasters in North America
- China, the United Sates, the Philippines, India and Indonesia together were the top five countries that are most frequently hit by natural disasters during the last decade.
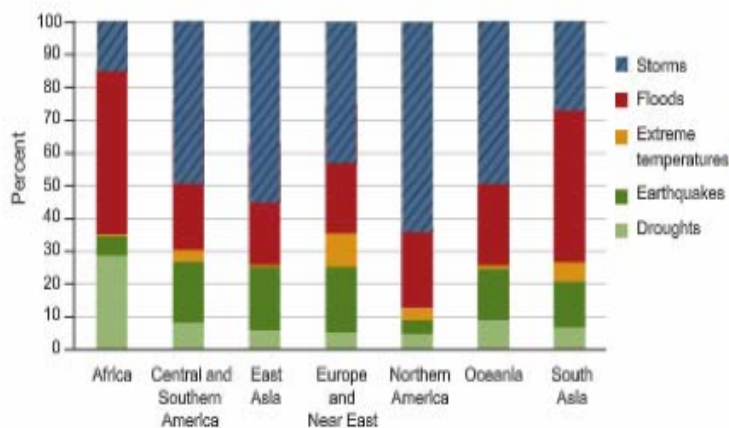
Hypothesis
- H_0 ; The lower income level of the countries, dose not increase in the average mortality rate from natural disasters.
- H_1 ; The lower income level of the countries increases the average mortality rate from natural disasters.

Research question
- Does the average mortality rate from natural disasters related to the development indexes based on the income?

Method
- Literature review and data gathering from (The World Bank, WHO, UNDP, UNAID,CDC, EM-DAT, American Red Cross, CIA)
- Normal distribution of the natural disasters assumed (technological disasters excluded)
- Categorizing the data due to income leveling of the World Bank
- Data from ten top countries regarding the number of people killed from natural disasters from 2006-2012
- SPSS version 19.2 for analysis and mortality rates
- Indexes from the World Bank data base

Approach

- Testing Hypothesis (One way ANOVA to compare the mortality rate in different income levels as well as Multiple comparisons Bonferroni analysis)
- Answering research question (Multiple regression analysis)

Results

ANOVA

mortalityrate

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.000	2	.000	3.740	.029
Within Groups	.000	70	.000		
Total	.001	72			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: mortalityrate
Bonferroni

(I) income level	(J) income level	Mean Difference (I-J)	Std. Error	Sig.
low income countries	middle income countries	.0022916324*	.0008521669	.027
	high income countries	.0022426116	.0010271297	.097
middle income countries	low income countries	-.002291632*	.0008521669	.027
	high income countries	-.0000490207	.0007743314	1.000
high income countries	low income countries	-.0022426116	.0010271297	.097
	middle income countries	.0000490207	.0007743314	1.000

Multiple Comparisons

Dependent Variable: mortalityrate
Bonferroni

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.000	7	.000	4.169	.001^b
	Residual	.000	56	.000		
	Total	.000	63			

a. Dependent Variable: mortalityrate

b. Predictors: (Constant), mass_movements, GDP per capita, earthquake_tsunami, GINI index, storms_hurricanes_cyclones, severe_weather, human development index

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.002	.002		.692	.492
	GINI index	.000	.000	.499	4.134	.000
	human development index	-.015	.004	-.755	-3.756	.000
	GDP per capita	9.399E-008	.000	.476	2.417	.019
	severe_weather	.002	.001	.194	1.378	.174
	earthquake_tsunami	.002	.001	.287	2.254	.028
	storms_hurricanes_cyclones	-.001	.001	-.074	-.607	.546
	mass_movements	-.001	.002	-.081	-.723	.473

a. Dependent Variable: mortalityrate

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: mortalityrate
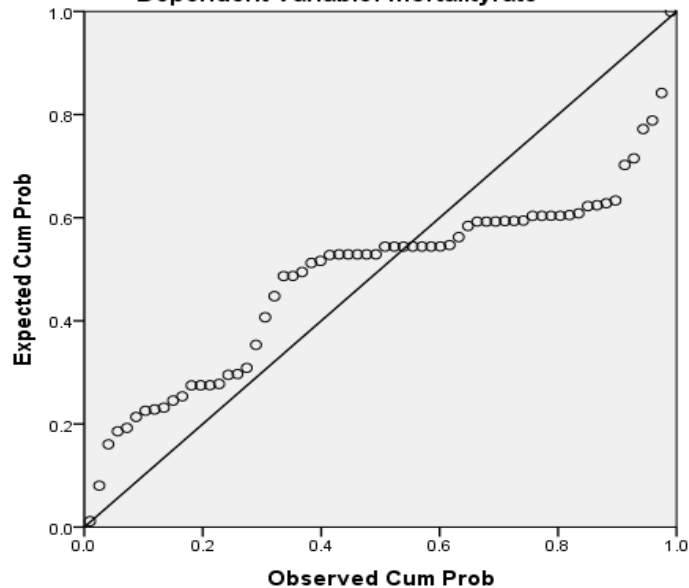
Conclusion
- The average mortality rate from natural disasters has statistically meaningful relationship with GINI index, HDI, and GDP per capita

- + The average mortality rate from natural disasters shows statistically meaningful relationship with the disaster type of Earthquake

Limitations
- Access to the complete profile of disasters
- The assumption of the normal distribution of the disasters (not enough evidence)
- Not enough data from some of the low-income countries (like Korea Dem Republic and some African countries)
- Measuring income and wealth
- More development indexes based on income has to be considered

Recommendations
- Investment on collecting accurate and reliable data banks from lower income level and developing countries
- Considering all development and socioeconomic indexes' relation with the mortality rate from natural disasters as part of risk reduction efforts
- Another study on educational level and life expectancy and disaster mortality rate
- Evaluating the reasons behind the higher frequency of the occurrence of the natural disasters in middle income countries
- Considering the difference with technological disasters also
- Conducting an international disaster mortality rate predictor index or scoring system. This index could be based on all indicators (social, economic, environmental and developmental) that could scientifically predict the disaster mortality rate in each country and area.
- Investment to reduce the income inequalities and injustice as one of the risk factors of disasters mortality rate.