The Loss of Societal Cohesion Due to the HIV/AIDS Epidemics

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Abstract

The loss of societal cohesion due to the HIV/AIDS epidemics is computed from the data made available by the World Health Organization and UNAIDS, The Joint United Nations Programme on HIV/AIDS. The values calculated for the loss of societal cohesion, reveal, for the year of 1999, the proximity of major societal breakdowns caused by the epidemics. Taking into account the number of people infected in 1999 it is shown that in some countries and regions society will be dangerously close to an irreversible rupture of its existence.

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1. Introduction

The recent past has seen the diffusion of HIV/AIDS epidemics throughout the planet. The WHO (World Health Organization) and UNAIDS have been publishing figures concerning the numbers of deceased and infected people per country [1][2][3] and per world region [4]. Although the upper and lower limits, for the year of 1999, of the WHO and UNAIDS data, for some countries, may raise doubts as to their accuracy, they are, nonetheless, the measurements that are possible at the present.

With the data on the numbers of deceased in 1999, the authors compute the loss of societal cohesion for countries and regions that are part of the WHO and UNAIDS databases. Taking into account the number of infected people they also calculated what will be the loss of cohesion when the epidemics run their course. The method employed has been published in connection with the loss of cohesion due to casualties in war [5], [6] and in past epidemics [7].

The results show that the measurement of the consequences of the penetration of the AIDS epidemic is better ascertained by the amount of information (entropy) generated by the number of people dying from the disease than by their percentage.

From the results obtained using the WHO and UNAIDS estimations for those infected in 1999 it is also shown that some countries will be approaching irreversible societal collapse in the number of years AIDS takes to claim people's lives.

It is also shown that, if the percentage of those infected rises, in subsequent years, above 36 % there will be, in some countries, an irreversible destruction of any kind of organic society.

2. Loss of Cohesion Equation

As reported in previous work [5][7], the amount of information, or entropy, observed, in a epidemic, for a ratio, x, between the number of those deceased and the total population is:

$$H_{obs} = - x \, . \ln (x) \qquad (1)$$

H_{obs} can be normalized by dividing per [-(1/e).ln(1/e)]. The normalisation has, amongst other advantages the avoidance of the dependency of the observed amount of information on the logarithmic basis.

In previous epidemic studies it has been shown [7] that there is a maximum of the observed entropy (H_{max}) beyond which a change in the structure of the system takes place. The structure within the system changes when x = 1/e.

For this epidemic's toll the amount of information, entropy, reaches its peak. A cohesion function χ (x) has been proposed to make explicit this change [5][9].

This function:

$$\chi (x) = [H_{obs}(x) / \Delta H_{max}(x)] - 1 \qquad (2)$$

with

$$\Delta H_{max}(x) = - \ln (1 - x) \qquad (3)$$

has, for a given structure, an infinite value for x = 0. It reaches zero for x = 1/e. For percentages larger than 1/e it becomes negative. This behaviour of χ (x) represents the societal loss of cohesion with an increasing number of lives lost. An irreversible change in the fabric of the society happens when x is larger than (1/e) as χ (x) < 0.

3. Results

In the table of the annex 1 we present, per country, the entropy generated by the HIV/AIDS epidemics and the consequent loss of societal cohesion for the maximum and the minimum values of the percentages of people dying from AIDS in 1999. In annex 2 we show the results of the same quantities for regions of the planet as aggregated by WHO and UNAIDS for the same year.

In annex 3 we have constructed, per country, a table with the same parameters computed with the percentage of those infected by HIV/AIDS in 1999. Annex 4 is a table of the same kind for each of the WHO/UNAIDS world regions.

4. Conclusions

The number of deaths caused by HIV/AIDS in 1999 is, already, producing in a number of countries and regions considerable desegregation.

From annex 1 it can be seen that the countries where the observed entropy is larger than 1/3 of its maximum value, are Botswana, Burundi, Central African Republic, Djibouti, Kenya, Lesotho, Malawi, Mozambique, South Africa, Swaziland, Zambia, and Zimbabwe. Botswana has already reached 2/3 of that maximum.

Yet, due to the fact that a few years elapse between infection and death, the depth of what is to come is not readily available from the figures in annexes 1 and 2.

The full extent of the epidemics consequences can only be envisaged when we look at the figures computed from the numbers of people infected in 1999 (annexes 3 and 4).

From annex 3, where the observed entropy has been computed from the percentage of infected people in 1999 rather than the deceased, the countries which have an entropy larger or equal than 1/3 of the maximum are Botswana, Burundi, Cameroon, Central African Republic, Congo, Cote d'Ivoire, Djibouti, Ethiopia, Kenya, Lesotho, Malawi, Mozambique, Namibia, Rwanda, South Africa, Swaziland, Uganda, United Republic of Tanzania, Zambia and Zimbabwe. Some of these countries will reach, in the

near future, an entropy larger than 0.75. These countries are on the brink of societal breakdown (annex 5).

The loss of societal cohesion is much higher than the percentage of those infected with HIV/AIDS would suggest. Notice, for instance, the case of Botswana, where a maximum estimation of 22% of the population has AIDS. The associated entropy corresponds to 90% of the maximum allowable for society to continue in a structured way. In Swaziland with a maximum of 15% of the people infected the amount of information is already 78% of the maximum allowable before a societal breakdown occurs. The region of sub-Saharan Africa had, in 1999, between 3.2% and 5.0% of people infected. These lower and upper percentages correspond in entropy terms to 30% and 41% of the maximum allowed for an organic society.

The countries in annex 5 will be, thus, dangerously close to a complete and irreversible loss of societal cohesion. It becomes apparent when the relative position of a country or a region is represented in the entropy curve (figure 1) or on its correspondent cohesion curve (figure 2).

Those countries close to the maximum are in a danger far greater then the raw figure for the percentage of the epidemics would indicate.

Since these figures pertain to 1999, any increase, in following years, in the percentage of those infected will move these societies, in the near future, beyond the threshold of recovery.

The entropy generated by the deaths caused by HIV/AIDS is a more realistic parameter on which to judge the dangers of these epidemics.

Thus, it seems that associated with the percentage of the population infected by HIV/AIDS a figure for the loss of its societal cohesion should also be explicit.

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Figure Captions:

Figure 1 – The entropy values of sub-Saharan Africa (■), Lesotho (O), Caribbean (×), Botswana (●) and Swaziland (△), calculated with the percentage of infected people in 1999, are indicated on the entropy curve.

Figure 2 – The cohesion values of sub-Saharan Africa (■), Lesotho (O), Caribbean (×), Botswana (●) and Swaziland (△), calculated with the percentage of infected people in 1999, are indicated on the cohesion curve.