Combining academic and intelligence knowledge and methods in finding optimal strategy for health policy and cyber security.

In answer to Call for White Papers: Social and Behavioral Sciences for National Security: A Decadal Survey.

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Abstract: Life style causes in the last year decrease of life expectancy in the United States and other reasons serve as motivation for application of Social Sciences to cyber security and even health policies and measures, as an extension of the intuitive approach as a result of application of Bayesian methods to defensive plans for operational integrity of the global networked security towards its application to cancer research, statistics, and surveillance.

Keywords: Health measures, immune system, cyber attack.

"Let an ultraintelligent machine be defined as a machine that can far surpass all the intellectual activities of any man however clever. Since the design of machines is one of these intellectual activities, an ultraintelligent machine could design even better machines; there would then unquestionably be an 'intelligence explosion,' and the intelligence of man would be left far behind. Thus the first ultraintelligent machine is the last invention that man need ever make, provided that the machine is docile enough to tell us how to keep it under control". Irvin John Good "Speculations Concerning the First Ultraintelligent Machine"

"One of the main difficulties in this subject is how to estimate the probabilities of events that have never occurred. That such probabilities are relevant to intelligence is to be expected, since intelligence is sometimes defined as the ability to adapt to new circumstances." Irvin John Good "Speculations Concerning the First Ultraintelligent Machine"

"The success of two-year decadal survey of social and behavioral sciences is dependent on input from the academic and intelligence communities." "The recent Ebola outbreak revealed many gaps and shortcomings in preparedness and the ability to respond effectively at both the national and global levels." "The Neglected Dimension of Global Security: A Framework to Counter Infectious Disease Crises"

1. Introduction and the reasons for involvement of SBS into National Security(NS).

These are the clear advices related to National and global intelligence (NI and GI). But why someone from the area of Social and Behavioral Sciences (SBS) would be involved in the issues of intelligence?

Following are the reasons for involvement of SBS into National Security (NS) and NI

1. The past year had something in figures that could turn an attention of SBS to join outside scientific community in their efforts to face the new challenges of the Centers for Disease Control and Prevention (CDC) recent report that was based mainly on 2015 death certificates. There were more than 2.7 million deaths, or about 86,000 more than the previous year.

The notion that the life expectancy in the United States has mostly risen since World War II may sound as some kind of alarm and is certainly a basis for the analysis. Average life expectancy declined for men, falling by more than two months, to 76 years and 3 ½ months in 2015. It fell by about one month for women, to 81 years and 2 ½ months according to the CDC report. The

increase was led by an unusual upturn in the death rate from the nation's leading killer, heart disease. Death rates also increased for chronic lower lung disease, accidental injuries, stroke, Alzheimer's disease, diabetes, kidney disease and suicide.
2. Researchers at Penn State Health Milton S. Hershey Medical Center linked the causes to ***lifestyle choices and obesity***. And those are problems we don't necessarily have medications for. Their approach was similar at Penn State Breast Center, where the new research suggested that women with stronger social connections while being treated for breast cancer may benefit more than those who don't have that kind of support. Certainly those problems are seemingly far away from prescribed medications and should be investigated by SBS specialists.
3. Looking from the other perspective we find that the deadly diseases not only contribute to the above mentioned problems, but also are associated with other aspects of NS&I or GS&I, such as terrorist attacks. House Speaker Newt Gingrich linked "terror" to "cancer" in the recent article. The article was reflecting on several terrorist attacks in Jordan, Turkey, and Berlin.

2. **The approaches that could be viewed at the beginning of evaluation of these events**.

A. We can use such expression as "terror cancer" in daily life without even realization of its meaning and without surprise, since it sounds familiar. But for scientific deduction in the first step the above facts would be considered as unrelated. Therefore, the first approach is ***intuitive approach.*** B. In the next step we can think about some kind of ***cyber attack or even cyber warfare, which broke some kind of defensive system that was planned for operational integrity of the global networked security*** [7]. C. Assume as it is usually the case that there are some possible ways that are called "policies" that can be taken towards the defense actions. And among these policies one wants ***to choose the optimal policy***. D. a) Following [7] that the result of application of Bayesian methods to defensive plans that would lead to development of network based on probabilistic framework would be based on intuitive explanations for the selection of optimal policy, b) considering that we are looking for SBS approach, and c) counting that besides cyber attacks factor we would like to take into account life style causes, the next step suggests to try ***to develop a modified approach***.

3. Introduction into modified approach with example from author's experience.

At this point I found out that it would be very useful to introduce my personal research finding based on my experience, presentations, and publications and later combined with other reports, Conferences, and researches.

I am a statistics major, and I earned my degree under late Academicians Herbert Robbins and Lawrence Shepp. Interview with Herbert Robbins has its place in the Introduction to Putnam Mathematical Competitions, and Lawrence Shepp was a onetime Winner of Putnam Mathematical Competition. Herbert Robbins also was a coauthor with Richard Courant, who was a student and coauthor with David Hilbert of several volumes, of the very popular book "*What Is Mathematics*?". The book deserved attention of Albert Einstein, who wrote a short review. Most of my recent works and interests in such fields as Pure Mathematics, Biopharmatheutics, DNA and RNA analysis, Analytical Chemistry in the Theory of Reaction Rates, Neuroscience, and Social and Behavioral Sciences are screened through the prism of belief and application of

multidimensional approach. Multidimensional approach in pure mathematics would lead to considerations of the questions related to normality of digits of pi, sqrt(2), and other irrational numbers, which was the issue of discussion for more than 100 last years, beginning from the famous theorem of Borel, and in the Theory of Reaction Rates it goes back to critique by Albert Einstein of Hedrick Born's assertions on quantum mechanics and on gas theory and the future debate between them, that started the year of Borel's statement of the theorem on normality of irrational numbers, when "Einstein had recognized that the Plank formula for black-body radiation cannot be derived if one assumes that light quanta behave like the independent molecules in the gases described by classical statistical mechanics." And now it is close to 90 years of "Vigorous discussions that took place at every opportunity, even including the delightful excursions."[11]. But some two and a half years ago, I was not yet so successful to hit exactly such important points in these scientific disciplines. And I was trying unsuccessfully though to find the late Prof. John Forbes Nash, who was awarded Nobel Prize in Economics for his Game Theory and works on Equilibrium after attending my first Chemical Conference in Princeton. The subjects I wanted to discuss were more related to the History of Probability and Computer Sciences: (a) one was about the history of the Equilibrium in Greek Literature; (b) and another one on some resemblances in Turing and Kolmogorov works. But in the late December I unexpectedly received an email from Professor David Banks of Duke University, to whom I would like to express my thanks, with the links to two volumes of "Good Book" that was edited by him. It was so astonishing for me that many of Irvin John Good's ideas resembled my understanding on the subject of Probability that I almost immediately decided to visit Professor David Banks and to speak to him about it. After a year or so Prof. Nash past away shortly after receiving Abel Prize for his works in Mathematics, and I could only attend a Conference in his honor. I was invited to make a Presentation at the 11th International Conference on Health Policy Statistics in Providence, RI in October, where I introduced the following ideas:

1. Reduction of infinite dimensional model to finite dimensional model that remains multidimensional model allows us to view the data of the epidemics outbreaks as related to changes ***in the immune system of the population.*** The examples are: Ebola virus, cancer, smallpox, etc... .It also sheds light on how to approach such problematic deceases, as Tuberculosis (TB), HIV, and diabetes mellitus, and there are certainly other diseases, where different stages of development, treatment, and vaccinations are related to immune system. It was certainly in the good agreement with Good's Article "Multivariate Tests after dimensionality reduction".

2. Besides the concentration on immune system, the model with reduced number of dimensions that still remains multidimensional model gives access to application of multiple measures method. The examples are: ***the measures*** that were proposed by WHO for fighting Ebola in contrast to the Smallpox Eradication Programme (1966-1980): **(1.)** The integration of disciplines in Medicine. This involved not only the promotion of knowledge sharing and collaboration, but also the coordination and facilitation of studies that will close important gaps in knowledge, such

as virology, diagnostics, clinical features, and epidemiology**. (2.)** The integration of disciplines in control measures in Ebola outbreak. This involved the impact of disease control measures on the evolution of the outbreak; to identify gaps and priorities for research; and to inform the development of a longer-term research agenda on hemorrhagic fevers…The approach of the World Health Organization (WHO) to the research was very much relying on statistical analysis with the series of questions. Some of them were related to the SBS: **1**. If the disease is a public health burden. **2.** If the vaccine is a good investment. **3.** How the additions would be implemented. And for control and intervention strategy: **1.** If the immunization is the best control strategy. **2.** And if it allows a new vaccine introduction, etc… So the guidelines were put into two broad categories:

(a) Political and technical criteria and
(b) Feasibility analysis for investments and success strategies.

3. Combination of health policy measures with political and investment strategies.
The last measures are the kind of measures and strategies that we are looking **for the defense or prophylactic strategy** in solving the complication of the cyber problem mentioned in the Paper. It was also very much believed that during 3 last years of introduction by WHO of control and intervention trails for Ebola vaccination gave significant reduction in deaths numbers, following contraction of the disease virus. The present President of Rutgers University Robert Barchi, who is a Member of the National Academy of Medicine, was pointing out during some of the Meetings with Alumni that his wife was working in Sierra Leone. On 11/7/15, WHO declared Sierra Leone free of Ebola virus transmission after two incubation periods, but on 11/10/15, CDC changed the country classification for Sierra Leone to a country with former widespread transmission and current, established control measures. It can be said that their decision was based on suspicion ***in the immune system of the population, which was based on the previous measures taken.***

Almost a year from now and right after the last Ebola outbreak in Sierra Leone, when in the mid January of the last year WHO made an urgent statement indicating that Guinea, Liberia and Sierra Leone continued to remain at high risk of additional small outbreaks of Ebola in the coming months due to the virus persisting in survivors after recovery, I was invited to make a Poster Presentation at the First International Conference on Stepped Wedge Trails Design in York University, UK that was held in the beginning of March. Since my Poster used a lot of mathematical inequalities, it is worth to mention that only days after me leaving London to New York, another Professor from Princeton University Andrew Wiles, who is presently Professor of Oxford University and previously was awarded a prize by International Mathematical Congress for his solution of Fermat's Last Theorem, was also awarded Abel Prize.
While I was working on my Presentation [6], I found that in October WHO at high-level Emergency Meeting on Ebola vaccination and financing convened at the request of several governments and representatives of the pharmaceutical industry stressed that though" Randomized Controlled Trials remain the "gold standard", however, many agreed on the appropriateness of using stepped-wedge designs as well." Though the statement could be understood as optional, which approach could be taken. However, the statistics of vaccination, in which only these individuals, who immediately after reminder of a doctor made the vaccination

were safe from contracting Ebola virus, and those who waited had a risk of contracting Ebola, which increased with waiting time, suggests that only Stepped Wedge Trails Design was applied without exceptions.

Most of the literature (some of them are mentioned in [6]) on the Stepped Wedge Trails Design including even different Encyclopedias compare the stepped wedge to randomized control trails, or as in ([34,35]in [6]) list it as a variation of the crossover design for randomized controlled trials. The approaches are definitely different in that the stepped wedge design uses the constraints under which policy makers and service managers operate and which themselves are in the need for rigorous scientific evaluations. And though researchers may believe an evaluation of an intervention is required, only the decision makers (that is, politicians and managers) are in control resources for system change ([32] in [6]). This implies that **SWTD was widely used previously for political measures and possibly was intended to fight cyber like breach in security**. However, this was one of the likely reasons for CDC classification change. As in October WHO reported some political tensions along with some custom problems and the Community unrest in Sierra Leone, prior to the Meeting on vaccination, It should also be taken into account that the Ebola outbreak was on the territory of three neighboring countries Sierra Leone, Guinea, and Liberia, which certainly contributed to some subjective beliefs by the population of these countries, such as some bewitched aircraft crashed somewhere in Sierra Leone, etc….Therefore, as it can be perceived that the experience from the efforts in treatment of Ebola in these countries ***can be considered as possible example in modeling approaches and measures for complicated problems related to cyber attacks in GS or NS.***

4. Application to National Security and Intelligence.

The problems of the GS&NS usually are greater, then studied in Sierra Leone, such as hacking during United States Elections, which was not the first cyber attack (some 8 years ago a Canadian research group found "GhostNet," a cyber espionage network of over 1,000 compromised computers in 103 countries that targeted diplomatic, political, economic, and military information. However, to make connection between cyber security and health policy issues understood better it is worth to mention the following reasoning for inclusion of Section on Behavioral Genetics in the Agenda of October 4-5 Summit on SBS for NS, CDC recently have asked NASEM to organize a workshop to discuss how the adoption of SI units for radiation protection in the United States could improve information exchanges and communications. The Workshop was moderated by Steven L. Simon from National Cancer Institute (NCI).

Relationship between International Units and Radiation Measurement can be understood through the fact that in many United States Presidential Elections the Candidates were closely tied resembling phenomenon of beat acoustics like George W. Bush v. Al Gore, and others. This Election results were predicted by Prof. Lichtman, Rorty, with Michael Moore correctly predicting states Ohio, Pennsylvania, and Wisconsin.

However, detection of cancer cells or circulating tumour cells (CTC) is done through application of magnetic resonance imaging (MRI), next-generation sequencing (NGS) machines, and the like methods using electric and magnetic waves, which when related to Analytical Chemistry or Solid State Physics of very thin epitaxial multilayers give closely related results for electron coherence rate, which is one of the core issues in Radiation Measurement for questions related to IU. MRI and NGS machines are becoming very inexpensive, as their repeated use is expanding.

5. Conclusion.

The integration of Political and Health Policy criteria and analysis for investments and success strategies are the necessary approach to the National Security.

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