TRACING INFECTIOUS DISEASES IN SOUTH AMERICA: AN IQ CHALLENGE

Research- in-progress

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Abstract

Biological Weapon (BW) agents are pathogens present in the nature that were included in weapons programs, but at the end, they are just microorganisms that cause diseases around the globe.

In this paper, we will show the aspects we consider are involved in the biological agents' epidemiology in South America and with special focus in Argentina, using open sources information, from an Information Quality (IQ) perspective.

In this sense, and after study the data obtained, we found out several IQ problems, such as, several IQ dimensions are affected and cultural and organizational aspects deeply affect the disease reporting process.

This is a research in progress; there is a long way ahead in this journey that tries to understand both the epidemiology of certain diseases and the disease reporting schema.

Given the fact that in this research we deal with national and supranational organizations information, we propose some recommendations to them in order to improve their situation.

Key Words: infectious diseases, South America, information quality

Introduction

Biological weapon agents are just pathogens present in the nature that were included in weapons programs, but at the end, they are just microorganisms that cause diseases around the globe. [1]

In this context, is important to point out that to know when and where the biological agents were and are, we could be able to predict a will be and future distribution. This is valid not just for biological weapons agents but also to common diseases spread. In this given situation, the analysis of pathogens distribution gains great importance.

Now in the biological weapons arena, to know and understand the epidemiological situation of the diseases caused by biological weapons agents will provide critical information in cases of alleged attacks investigations and possible agent sources, among others.

Because of the complexity of the world epidemiological situation, we narrow our study to South America, the region where we live.

Background

The understanding of the regional epidemiological situation will allow us not just know which listed agents are present in the area and their history (background information) but also to have useful information for health plans elaboration and response systems organization, and at the same time, to have key elements in the attribution process in case of a biological attack.

Talking about the importance of knowing the epidemiological background information, Anne L. Clunan [2] clearly establishes its role in the Conclusion Chapter of her book, where she (like the other authors which also participated on the book) pointed out the role and importance of the background information not just in case of biological attacks but in health care topics.

In this context, is relevant to point out that there is no information or information sources 100% trustable, and because of this situation, is important to consider and use state of the art techniques to obtain the maximum profit of the raw elements used to build the research.

Taking into account this situation, we apply Information Quality and Total Data Quality Management techniques and tools in order to perform our research in a more complete and deep way. This new approach applied to the building of epidemiological information databases, allow us to count with a better quality product and to discover the problems with the traditional information sources in this field (WHO, PAHO, Promed, CDC, Health Ministries, etc.).

Due to the scope of this paper, the deep study of the different information sources wasn't included, that will be objective of future research.

Rationale & Purpose

This research combines two areas: biological weapons agents' situation in South America and information quality, meaning we use IQ tools to understand the diseases under study distribution.

The purpose of this research is the understanding of the geographical distribution regarding some specific diseases (BW agent caused diseases).

As a secondary objective is the identification of failures on the disease reporting system, as a first step to elaborate recommendations to the health care system.

Methodology

In order to fulfill the objectives of this research we analyze the open sources available. To do that, we used Google as a search engine and also the search engines from each website belonging to organizations considered, such as WHO, PAHO, CDC.

We also made consultations to experts and access to relevant books from the fields included in this study.

Regarding to the specific study about BW agents in the region and Argentina, we took as starting point the Australia Group Core list of Human Pathogens, updated in 2009, because we consider it the broader and

more comprehensive list. From there, we first look through Internet in order to find which agents and diseases are present in South America[1].

We considered a temporal frame of 10 years (from 1998 to 2008) for our analysis and also we registered the source of the more relevant information (from supranational to local levels) in order to qualify them and categorize them using information quality methodology. [3], [4], [5]

Results

Disease Surveillance and BW agents present in South America

Taking the Australia Group Core List for Human Pathogens [6], the section about virus, we identify the listed BW agents presents in South America through a search of relevant information in the web.

It was possible to determine the presence of the following agents, both like as an endemic disease and occasional outbreaks.

BW agent	Country
Dengue fever virus	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Perú.
Eastern equine encephalitis virus	Argentina, Brazil
Hantaan virus	Argentina, Bolivia, Brazil, Chile, Paraguay, Uruguay, Venezuela
Junin virus	Argentina
Lymphocytic choriomeningitis virus	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Perú, Uruguay, Venezuela
Machupo virus	Bolivia
Venezuelan equine encephalitis	Argentina, Brazil, Colombia, Ecuador, Perú, Venezuela
Western equine encephalitis	Argentina,
Yellow fever virus	Argentina, Bolivia, Brazil, Colombia, Ecuador, Paraguay, Peru, Venezuela
Oropuche virus	Argentina, Brazil, Peru
Rocio virus	Argentina, Brazil,
St Louis virus	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela
Sabia virus	Brazil
Flexal virus	Brazil
Guanarito virus	Venezuela

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[1] Guyana, French Guayana and Surinam were excluded of this analysis because of the almost complete lack of data.

BW agent	Country
West Nile virus	Argentina

Table 1: BW agents present in South America.

It is important to point out that the information showed in the Table 1 was built considering more than one information source in each case and taking the smallest indicator of presence as an affirmative answer. The last concept is based on, first, the complications if the determination of the presence of a specific disease due to the geographic situation, the characteristics of the labs involved, the health care politics, control regulations and the difficulties inherent to the diseases and etiologic agents under consideration.

At this stage it was not possible to identify the number of cases, death ratio, etc. due to the figures complexity found.

Disease Surveillance and BW agents present in Argentina

In this specific point we want not just to identify which agents are present in Argentina naturally, but also include where they are because of humans activities, such as research programs.

BW agents present in Argentina

Following the previous logic, and considering as starting point the Core List for Human Pathogens from the Australia Group, after a search through Internet it was possible to establish the presence of the next BW agents in Argentina: Dengue fever virus, Eastern equine encephalitis virus, Hantaan virus, Junin virus, Lymphocytic choriomeningitis virus, Venezuelan equine encephalitis, Western equine encephalitis, Yellow fever virus, St Louis virus, Oropuche virus, Rocio virus, and West Nile virus.

Projects which involve BW agents

Through the search made to determine the presence of BW agents in South America and Argentina, it was possible to detect the existence of diverse research teams along the argentine territory. Those groups work with the virus previously mentioned and the diseases that they generate, in pure and applied science research, vaccine development, sanitary control and monitor activities, etc.

Next is showed a list with the more relevant Institutions[2] and the agents they work with:

National Administration of Laboratories and Health Institutes (ANLIS) "Dr. Carlos G. Malbrán", Health Ministry.

- Nacional Institute of Human Viral Diseases (INEVH): Lymphocytic choriomeningitis virus; Dengue virus; Hantaan virus; and Junin virus.

- National Center for Diagnosis and Research in Endemoepidemics: Hantaan virus.

- Chagas National Institute "Dr. Mario Fatala Chaben," Buenos Aires: Hantaan virus.

- Comahue Nacional University: Hantaan virus.

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[2] This list is not exhaustive.

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- Virology Laboratory, Exact and Natural Sciences Faculty, Buenos Aires University: Hantaan virus.

- Veterinary Sciences Faculty, La Pampa National University: Hantaan virus.

- Virology Institute "Dr. J. M. Vanella", Medical Sciences Faculty, Cordoba National University: St Louis encephalitis virus; VEE virus; WN virus

In some of the research activities also participated National Hospitals, especially in activities related with the patient control and local diseases surveys.

BLS 3 Laboratories

In July 2006, where the Malbran Institute is located, it was inaugurated the first BSL3 internationally certified laboratory in Argentina, called Operative Unit "Biological Containment Center" (UOCCB). It also has BSL2 facilities.

The SENASA (Agro-alimentary Health and Quality National Service) also has a high level of containment lab, which could be considered as BSL3[3] since the end of the 09's.

Information Analysis: Information Quality

During the last 15 years, we witnessed the Information Technology revolution and it consequences in our daily life and work dynamic.

Even when we are immersed in an information sea, it is possible to identify different levels (Figure 1) of where the information is and how it relates to each other. In this case the broader context is the enterprise environment, which in our case could be considered like the human health situation in South America and how it is converted into statistics. The level 2 could be the information inside the health organizations and how it is processed and showed. And finally the level 3 could be considered like the small amount of information that a decision maker need to plan and establish a health strategy.

So in the Figure we can see not just the relations between the different levels but the amount of information in each case.

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[3] This laboratory is not certified as BSL3 by international organizations yet, accordingly with the available information.
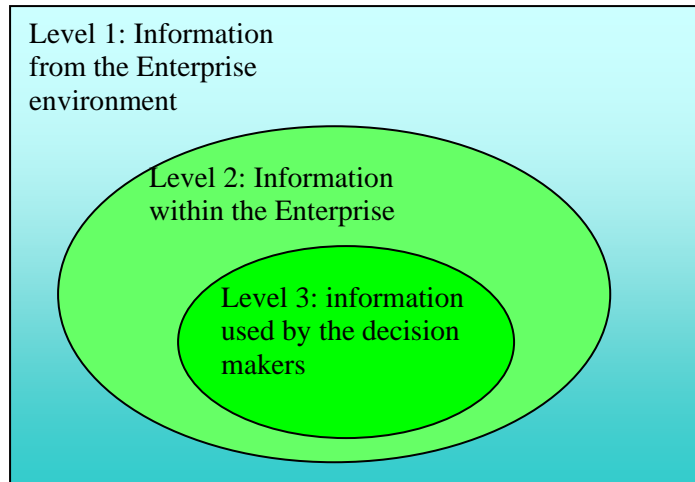
Figure 1: Path that information takes on its way to supporting and decision. [7]

The information available to carry out different analysis is not always clear and coincident, and for those reasons –among others- it is necessary to perform the studies under the Information Quality (IQ) perspective. That means, first, to take the Total Data Quality Management -TDQM- cycle (Define, Measure, Analyze and Improve) and second, to select the IQ dimensions relevant to the diverse situations found in the epidemiological study. [3]

Due to the objectives and characteristics of this research, it will be considered just a part of the cycle:

1. Define the research area, objectives and the scope of the search;

2. Measure (qualitatively) the current situation; and

3. Analyze the results and propose an improvement program.

It will be possible to make, and we will, recommendations for the improvement of the situation of the epidemiological information, but since it is in the hands of states or internationals organizations, at this point is not possible to make any change.

From the IQ perspective, there are at least 16 dimensions from the information that are relevant to study and determine it quality, showed in Table 3.

Categories	Dimensions
Intrinsic	Accuracy, Believability, Objectivity Reputation
Contextual	Value-added, Relevancy, Timeliness, Completeness, Amount of data
Representational	Interpretability, Easy of understanding, representational consistency, conciseness of representation
Accessibility	Access, Security

Table 3: Information Quality Categories and Dimensions [5]

Even when after look at all the categories and dimensions we think that all are important information attributes, we selected those that are specifically important for the epidemiological analysis and explain the reasons.

Category: Intrinsic

When it comes to epidemiological information, believability and reputation comes together and we also view both as close related to objectivity.

Even when accuracy sounds more important, a qualitative data from a believable source can be more useful than a quantitative data from a non believable source.

In summary, if we want to know the big picture of the epidemiological situation in a given region or country, we need information that is believable, objective and with reputation, and a qualitative data will be enough. But if we are decision makers designing a health strategy, we will need also accurate information with quantitative data.

Category: Contextual

In the situation where we are gathering epidemiological information we found tons of it, from different sources (media news, NGOs, supranational organizations, scientific publications, health ministries news, etc.), some of the duplicate, and some unique data hided into a non related article.

The amount of data is a critical issue, difficult to deal with and depend on how much time and resources the researcher has if this is a problem or not. Any way, Internet shows us a huge amount of information, most of the times impossible to be processed.

In the other side is the completeness of the info, because we all know that to have tons of information doesn't mean that you have all the information you need.

Also other issues are the value added (how much information is duplicated or doesn't make new contribution?) and relevancy (is the new information important considering the objectives of the research?). We know that both situations look like a small problem, but it is necessary to read all documents to know if the new info adds value and if are relevant.

Timeliness is related to the age of the data and if is out-of-date or not. In the health field, is a critical aspect, to have actualized information makes a huge difference both strategic health planning and in the antibiotic stock in a pharmacy.

Category: Representational

Epidemiological information should be easy to understand and to interpret: number of sick people; number of dead people; area covered by the disease' vector; transmission strategy; etc. For example, should be clear if we are talking about number of cases if are just people sick or include the dead ones due to the disease. This example is close related to the conciseness of representation and shows its importance.

Representational consistency inside an organization will allow us to follow a disease evolution and trust on the results.

Category: Accessibility

The balance between access and security it is possible to see in most of the research fields. In the case of epidemiological studies, is important to have as much information is possible open to be analyzed by

experts, and at the same time restricted access to the information relevant to carry out a biological weapons attack by a state actor or a terrorist organization.

Discussion

During this research, we experienced several problems due to the lack of quality of the information gathered on Internet. In this sense, to apply Information Quality tools and techniques allowed us to reach a better understanding of the situation, but is not the solution to the problem, it is just an approximation to it.

To be able to evaluate the information, allow us to evaluate their sources, using the same criteria. Perform this kind of analysis will give us the raw material to understand how the organization work and how it is possible to improve their results.

Using IQ criteria to information and sources, it was possible to identify some problems with epidemiological information, for example:

1. Argentina shows in the Health Ministry web site just two listed diseases (Yellow fever and Dengue fever), and there is no information available about the rest of the diseases identified in this research that are a problem to the society, like the Hantaan virus.

2. WHO shows statistic information about several diseases that doesn't match with research papers published in the same website. That fact is true to the Yellow fever in Argentina.

There were detected more conflictive situations that are the core objective of a broader research about epidemiological information sources that is under elaboration by the author of this paper.

Limitations

The results of this research show us that there are serious problems with the information regarding diseases distribution in South America, not because of local organizations but for international ones too.

So, even when we identify the problems, define and communicate them, if the organizations which deal with the information and are in charge of implement changes don't accept they have problems with their information, the issue becomes enormous, arrogant organizations have the potential to cause extreme damage.

In summary, even when we identify and communicate the information quality problems, the lack of interest showed by certain organizations is a constrain to the implementation of changes that lead to a better understanding of the epidemiological studies.

Summary and Conclusions

The steps followed in order to fulfill this paper objectives took us to an information journey. We had several good and profitable moments and also difficult and complicated ones. But as summary we can say that we learned a lesson in each step.

Taking into account that for us, biological weapons agents control goes beyond laboratory biosecurity, including health care topics and research projects, the standard chosen was high, but the results and the understanding of the regional and national situation was the effort reward.

To study the regional and national epidemiological situation let us know the disease's dynamic and also the behavior of several organizations.

The information quality method allows us to extract the best from the available information on open sources. This innovative vision gives us tools to better understand the epidemiological situation and create a work framework that we hope will make an original contribution to the body of knowledge.

After going through the relevant information we could said that:

1. The epidemiological information about BW agents presents in South America is poor, most of the time difficult to find and trust.

2. The epidemiological information about BW agents presents in Argentina is poor, most of the times difficult to find and to trust.

3. The international organizations which deal with epidemiological information showed deficiencies too, especially when it comes to documents presented in different formats.

4. The regional epidemiological situation was possible to determine and it shows a greater complexity than we expected.

5. The BSL3 Labs in Argentina appear to be under the right control and surveillance as well as the research projects carried out in the country.

6. The information quality tools application allows us to have an innovative perspective and almost complete understanding of the information flow.

Recommendations

The epidemiological information analysis is a dynamic process and it is important to keep the databases updated and the core concepts under continuous review. The background databases elaboration will give us an advantage both in health care planning and in case of a BW attack.

Even when the background information is important, we have to bear in mind the fact that there are other factors which change the epidemiological situation. Among them, we can point out the following:

- Increase of the international flights and globalization;

- Poor sanitary and living conditions;

- Changes in health and food technology that create new opportunities for pathogens;

- Changes in populations behavior (adventure tourism, trekking, riding, etc);

- Expansion in populated areas;

- Pathogens evolution; and

- Arise of new pathogens.

As Anne Clunan (2006) said in her book, the paradigm change from "need to know" to "need to share", shows the importance of interdisciplinary work; it is key to improve the dynamics of biodefense and health care.

Applying information quality tools improve the diseases databases elaboration, and its broader use will take us to a better situation when it comes to health and diseases statistics.

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