HOW TO RECONSIDER IMPACT PROFILING OF BIOLOGICAL EVENTS AFTER COVID19

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Abstract
Caused accidentally by human error, generated by natural/technological disasters or determined intentionally as criminal/malicious/terroristic acts, chemical, biological, radiological and nuclear (CBRN) events have different types of impacts on the affected area. A number of factors characterizes such impacts. Among them, density of population, geographical features, weather conditions, quantity of dispersed substances, contamination rate of dispersed substances, health-care services response efficiency.
In the last years effort in investigating impacts of CBRN events has been focused on: 1) caused accidentally by human error (e.g. Chernobyl), generated by technological disasters (e.g. Seveso), determined intentionally as criminal/malicious/terroristic acts (e.g. Tokyo); 2) economic effects (direct and indirect) and casualties; 3) case-specific methodologies. CBRN events increasingly gained positions in the priority agendas of the decision and policy makers in most of the countries of the world.
A "human-centric" view has characterized also the decision and policy makers at EU level*…"chemical, biological, radiological and nuclear (CBRN) materials are produced, transported and handled under many different circumstances, posing a risk to society; while so far major incidents involving CBRN materials, including terrorist acts, have been relatively few, the consequences of such an incident could be devastating"* (Council Conclusions 15505/1/09 rev.1).
Additionally Communication COM(2009) 273 final, on Strengthening Chemical, Biological, Radiological and Nuclear Security in the European Union – an EU CBRN Action Plan (24 June 2009) reports that *"… it is clear that no public authority can afford to ignore this threat given its potentially very significant consequences in terms of human life and its economic effects. There is also a consensus amongst experts that the case of a somewhat limited attack needs to be carefully considered because the psychological, health and economic effects on the population of even a small scale attack using such materials would be significant"*. The same focus has been confirmed in the Communication COM(2017) 619 final, Action Plan to enhance preparedness against chemical, biological, radiological and nuclear security risks (18 October 2017). *"The EU is currently facing a range of terrorist threats and attacks of a violent nature, from both networked groups and lone actors. Both terrorist groups and radicalised individuals have sought to carry out mass-casualty attacks in the EU with the aim of maximising both the number of victims and the psychological and economic impact on society"… "Even at a small scale, a CBRN attack may have a considerable impact on the societies and economies against which they are used, resulting in significant and lasting disruption, widespread fear and uncertainty. Both the human and financial costs associated with attacks,*

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involving for instance a radioactive dispersal device (also known as dirty bomb) or an anthrax attack using unmanned aerial systems, could be extremely high."

A number of approaches has been used to assess the impact of CBRN events (Kaufmann et al., 1997, RAND Corporation) and the categorization of economic impacts proposed by Ramseger et al. (2009) seems to be the most convincing for any type of CBRN event. Costs are for: a) first response measures; b) recovery, reconstruction, restoration; c) indirect damages; d) macro-economic losses. When the biological events are considered Cavallini et al. (2014) propose to highlight a second dimension affecting the economic impact (in addition to the "large-scale effects" defined in Ramseger et al., 2009), the persistence of effects. Tables below makes evident such distinction between B events and the other ones on the basis of Garcia et al. (2011) and Kollec (2006).

Elements characterizing CBRN materials

	Biological material	Chemical material	Radiological material	Nuclear material
Symptoms displays	Delayed	Rapid	Rapid and delayed	Immediate and delayed
Casualties appearance	Gradual and in a spread way	Simultaneous and concentrated	Simultaneous, gradual and in a spread way	Simultaneous, gradual and in a spread way
Persistence in the environment	High	Low	Very high	Very high

Source: Cavallini et. al. Elaboration based on Garcia et al. (2011)

Factors affecting persistence

	Biological material	Chemical material	Nuclear/radiological material
Onset	Slow	Rapid	Rapid
Transmission/infectivity	Slow, agent dependent	Fast, agent dependent	Particulate only, fast
Detection	Difficult	Easier	Easier
Resource consumption	Gradual, long term	Rapid, short term, some long term	Rapid, short and long term
Public health involvement	Short and long term	Short term	Short and long term
Bed use	Mixed	Hospital	Hospital
Decon. requirements	Agent dependant	Critical for all	Critical for particulate
Antidote	Agent dependant	Class dependant	None

Source: Cavallini et. al. based on Kollek (2006)

Persistence of the B threat after an event made possible to organize costs (intended as economic impact) looking at short term, medium term and long term (Cavallini et al., 2014).

Categories of costs of events generated by B material taking into account persistence

Type of cost	Short term	Mid term	Long term
First response measures	• Rescue of injured and threatened people • Evacuation • Registration of contamination • Immediate decontamination • Measures to cordon off the contaminated area	• Blocking the spread of dangerous biological materials	
Recovery, reconstruction, restoration	• Health care for injured people	• Cleaning up measures and thorough decontamination • Resettlement and relocation • Restoration of infrastructure: transport system, public services (water supply, electricity) • Gathering of infected animals • Clearance of contaminated cadavers and plants (Biological waste management substances)	• Costs for the deceased (medical forensics, funerals, life insurances) • Pensions, etc. for disabled people
Indirect damage cost	• Loss of earnings caused by loss of consumer confidence • Loss of earnings caused by decline in tourism • Loss of earnings resulting from injuries/sicknesses or death of Employees	• Loss of earnings because of state of emergency (regional and international) • Loss of earnings caused by (preventive) culling • Economic impact of temporary infrastructure breakdown: transportation system, public services (water supply, electricity, telephone network)	• Economic impact of temporary infrastructure breakdown: transportation system, public services (water supply, electricity, telephone network)
Macroeconomic loss		• Consequential costs from loss of income (multiplier effects)	• Loss of investor confidence/propensity to save

Source: Cavallini et. al. based on elaboration of Ramseger et al. (2009)

COVID19 pandemic has changed the paradigm. The B event is no more human-centric. It is more similar to a natural disaster. At the end of November 2020 COVID19 pandemic has generated almost 1.5 million fatalities in less than 1 year. The virus is spread around the world, in all continents and in all the countries. Its persistence is proven by the fact that it is still a world-wide high-level threat and that in a number of countries more than one "wave" of contamination occurred (in Europe the first wave happened before summer 2020 and the second wave in the second part 2020). Policy and decision reacted accordingly. JOIN(2020) 11 final, Communication on the Global EU response to

COVID-19 reports the change of perspective for B events. *"The coronavirus outbreak has evolved into a global pandemic. It has killed tens of thousands of people, straining communities, increasing calls for social protection, shrinking business activity and disrupting supply chains. Its consequences will be profound. Having appeared first in China, the pandemic has now spread in Europe and around the globe, with a spill over on social stability and security."…"This unprecedented health crisis will most likely bring adverse economic and social effects: these have to be tackled as a matter of urgency to prevent destabilisation. This requires actions on several fronts: cushions in the face of possible macro-economic shock, appropriate backing to financial intermediaries, a mix of financing options for the public and private sector. It also includes ensure a protective framework for the work force and incomeless households."*
However, COVID19 is not the infectious disease with the highest impact in the modern era. The Spanish flu occurred one century ago (1918-1920) generated a death toll of around 40-50 million people.

Spanish flu (1918 – 1920)

Source: Indian Press, Emergency hospital at Camp Funston, Kansas (USA)
Photo by Harris & Ewing via Wikipedia Commons)

COVID19 (2020 – …)

Source: El Pais. Pavilion 5 of the field hospital of Ifema in Madrid (Spain)
Photo modified by the author

Among the commonalities between the two high-impact pandemics, the intensity/frequency of human contacts. The Spanish flu appeared in early March 1918 at Camp Funston in Kansas and spread quickly through the 54,000 troops in the army installation. As U.S. troops were deployed for the war effort in Europe, they spread the virus (April-May 1918)in England, France, Spain and Italy.
This evidence suggests to consider also a multiplier factor given by the intensity/frequency of human contacts (as spreading factor as well as a resilience source) together with the large-scale effect and the persistence when defining the impact profile of biological events. Further research will be devoted to define a three-dimension approach with the final aim to better support policy and decision makers to design and implement measures addressing B events as pandemics in all the crucial phases of emergency management i.e. prevention, preparedness, response, recovery.

Keywords

CBRN, biological events, impact profiles, persistence, intensity/frequency of human contacts

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