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Conceptual analysis of health systems resilience: a scoping review

C. Pailliard Turenne ¹, L. Gautier ², S. Degroote ³, E. Guillard ⁴, F. Chabrol ⁵, V. Ridde ⁶

¹ French Institute for Research on sustainable Development (IRD), IRD Paris Descartes University (CEPED), Université Sorbonne Paris Cité, 45 Rue des Saints-Pères, 75006 Paris, France
cpturenne@hotmail.fr

² Department of social and preventive medicine, University of Montreal, Montreal, Canada; Public Health Research Institute, University of Montreal, 2900 Boulevard Edouard-Montpetit, Montréal, QC H3T 1J4, Canada; CESSMA (IRD-Paris-Diderot University), Université Sorbonne Paris Cité, Bâtiment Olympe de Gouges (8ème étage - secrétariat bureau 817) rue Albert Einstein, 75013 PARIS, France
lara.gautier@umontreal.ca

³ French Institute for Research on sustainable Development (IRD), IRD Paris Descartes University (CEPED), Université Sorbonne Paris Cité, 45 Rue des Saints-Pères, 75006 Paris, France
stephaniedegroote.recherche@gmail.com

⁴ SOLTHIS, 6 rue Sadi Carnot, 93170 Bagnolet, France
etienne.quillard@solthis.org

⁵ French Institute for Research on sustainable Development (IRD), IRD Paris Descartes University (CEPED), Université Sorbonne Paris Cité, 45 Rue des Saints-Pères, 75006 Paris, France
fanny.chabrol@ird.fr

⁶ French Institute for Research on sustainable Development (IRD), IRD Paris Descartes University (CEPED), Université Sorbonne Paris Cité, 45 Rue des Saints-Pères, 75006 Paris, France
valery.ridde@ird.fr

Corresponding author : Charlotte PAILLIARD TURENNE
103 impasse des moissons, 76290 Montivilliers, France
cpturenne@hotmail.fr
0033 (0)6 49 11 64 19

Abstract: System resilience has long been an area of study, and the term has become increasingly used across different sectors. Studies on resilience in health systems are more recent, multiplying particularly since the 2014 Ebola epidemic in West Africa. World Health Organization (WHO) is calling for national governments to increase the resilience of their health systems. Concepts help define research objects and guide the analysis. Yet to be useful, the concepts need to be clear and precise.

We aimed to improve the conceptual understanding of health systems resilience by conducting a scoping review to describe current knowledge in this area. We searched for literature in 10 databases, and analyzed data using a list of themes. We evaluated the clarity and the precision of the concept of *health systems resilience* using Daigneault & Jacob's three dimensions of a concept: *term*, *sense*, and *referent*.

Of the 1 091 documents initially identified, 45 met the inclusion criteria. Term: multiple terms are used, switching from one to the other to speak about the same subject. Sense: there is no consensus yet on a unique definition. Referent: the magnitude and nature of events that resilient health systems face differ with context, covering a broad range of situations from sudden crisis to everyday challenges.

The lack of clarity in this conceptualization hinders the expansion of knowledge, the creation of reliable analytical tools, and the effectiveness of communication. The current conceptualization of *health systems resilience* is too scattered to enable the enhancement of this concept with great potential, opening a large avenue for future research.

Keywords: Resilience, health system, health system resilience, conceptual analysis

Background

The World Health Organization's (WHO) reports on the performance of health systems [1] and on universal health coverage [2] highlight that health systems in low- and middle-income

countries (LMICs) are still facing multiple challenges, owing to their performance, responsiveness, and resilience. The topic of *health systems resilience* has gained major traction over the past few years.

In 1973, [C.S Holling](#) [3] worked on the resilience of ecological systems. He applied to ecosystems the theory of complex adaptive systems: that such systems can respond to the constraints of an ever-changing environment [4]. Holling demonstrated their ability to absorb the effects of many disturbances that can be unpredictable. Resilience became a measure of disruption that a system can absorb. The concept has extended to complex systems science through various fields (economics, politics, etc.). This strand of work is called *resilience thinking* [5], and seeks to study how systems change and respond to disturbances. Since then, there has been widespread use and popularization of the concept of *resilience*. In January 2013, Time Magazine ran the headline *Adapt or Die: Why Environmental Buzzword of 2013 Will Be Resilience* [6]. That same year, the Rockefeller Foundation launched the *100 Resilient Cities* project to help selected cities become more resilient. Thenceforth, WHO has included resilience in the formulation of the 2030 Sustainable Development Goals (SDG). It was an essential part of the 2016 report, *Universal Health Coverage: Moving Towards Better Health* [7], which featured five important areas of competence under which health systems must work. In 2017, following the 2016 Global Symposium on Health Systems Research, Health Policy and Planning published a special issue entitled *Resilient and Responsive Health Systems for a Changing World* (Vol. 32, Issue suppl_3).

The sheer number of examples suggests that the term *resilience* readily spreads to multiple sectors. The term soon turned into a new benchmark for an increasing number of actors and areas. Studies on resilience have been published for decades, mainly in engineering sciences, scientific ecology, and developmental psychology [8] [9] [10] [11]. However, studies specifically on the resilience of health systems are much more recent. They have proliferated since the 2014 Ebola crisis in West Africa, which the United Nations considered a “wake-up call” for increased global action to prevent future health crisis [12] [13]. In 2014, a high-level meeting

between the African Development Bank, the World Bank, the West African Health Organization, WHO, ministers of several countries, and varied non-state actors took place in Geneva. This meeting resulted in a WHO publication calling for national governments to “develop and implement strategies to make their health systems stronger and more resilient” with the help of the international community and research [14]. Yet resilience in health systems remains a very broad concept. Its scope is multisectoral (health, social sciences, economics, etc.); multilevel (micro/individual, meso/organizational, macro/political, and national); and it involves multiple populations (individuals, communities, decision-makers, professional, scientists, etc.). Diverse panels of experts have noted the relevance of strengthening resilience of health systems to tackle health crises [12] [15]. The concept continues to attract major attention: it is “*a key pillar of Health 2020*” [16]. The goal is to translate it into an operational indicator that could be easily evaluated: “resilience-related research is moving from purely conceptual thinking to a search for operational ways and means of building resilience” [16]. Currently, resilience indicators mostly derive from an individual approach coming from research in psychology [17], and there is an urgent need “to address gaps and enhance global capacity to rapidly detect and respond to health crises” [15]. In 2017, [Kruk et al](#) [18] made an initial proposal for a resilience index; they are now calling for testing it in order to review and refine the list of proposed indicators [18].

Sharing common language and framing allow us to measure and analyze the same research issue [19] [20]. Concepts need to have high level of clarity and precision to guarantee effective communication between actors or institutions, and to enable valid empirical study [19].

The objective of this paper is to describe how health systems resilience concept is defined in order to uncover its “ontology” (the explicit specification of its structure), and improve its conceptual knowledge as to apply it effectively.

Method

A *scoping review* is a review methodology that allows for a preliminary assessment to identify nature and extent of available evidence (including ongoing research).

We conducted our review using [Arksey & O'Malley's](#) [21] methodological framework, based on five main stages: (a) identifying the research question; (b) identifying relevant studies; (c) studies selection; (d) charting the data; and (e) summarizing and analyzing the results. We complemented it with subsequent improvement from VERDAS consortium protocol (pilot round realization) [22].

1- Research question

For this scoping review, our research question was: *“What is known from the literature about the concept of health systems resilience and its dimensions?”*

Data analysis aimed at (a) determining how peer-reviewed and grey literature contributes to the three dimensions of the concept of “health systems resilience” as defined by [Daigneault & Jacob](#) [19]: term, sense, referent; and (b) identifying the differences and similarities in the understanding and use of this concept.

2- Relevant literature identification

Typical public health, social sciences, economics, and biomedical English and French databases were searched: six scientific databases (Pubmed, Scopus, CAIRN, EBSCO host, ScienceDirect, BDSP) and four grey literature databases (Google Scholar, Opengrey, WHOLIS, DUMAS). The search was completed manually, looking in archives of key scientific journals (Health Policy and Planning, Revue internationale des études du développement, PLOS ONE) and from discussions with several experts from humanitarian and development sector (whereby Action Against Hunger provided manuals dealing with the subject). We checked reference lists of included studies for potentially relevant articles.

We used various combinations of keywords and all possible associated terms in French or English: (“resilience” OR “coping strategies” OR “system responsiveness” OR “system

adaptation”) AND (“health* systems” OR “health* system plan*” OR “health polic*” OR “health system research” OR “national health program” OR “efficien* organization*”) AND NOT (“psychology* resilience” OR “personal resilience” OR “mental health”). The complete search strategy is provided in Appendix 1. Our search strategy was validated by a librarian at the University of Bordeaux. All selected documents were saved in Zotero software.

3- Studies selection

The initial search process picked up many duplicates, confirming the completeness of the search. Pilot screening was performed on 20 abstracts randomly chosen in order to define post hoc eligibility criteria. Studies were included if they met 2 criterion: (a) the term *resilience* was used in title, abstract, or keywords; and (b) health systems represented the main analytical level of the study. Articles were excluded if they (a) focused on psychological dimensions of resilience; (b) focused on specific thematic area (e.g. climate change, training process, hospital organization, management of illness, etc.) or groups of actors (e.g. doctors, nurses, service managers, etc.); or (c) were not available in full text versions. The articles that met the inclusion criteria after the title and abstract screening were then reviewed in full by the same reviewers. A second reviewer (anonymous) was consulted to resolve any discrepancies at each stage of the process (started in April 2018 and ended in June 2018).

4- Data extraction

Data extracting forms were created on Excel to collect both macro-data (descriptive characteristics of the included studies) and micro-data (definitions, resilience dimensions, implementation methods, and authors' recommendations) from the selected literature

5- Data analysis: the conceptual approach

To define the concept of *health systems resilience*, we used [Daigneault & Jacob's](#) conceptual analysis [19] that highlighted three essential dimensions of a concept (Figure 1): *term*, *sense*, and *referent*.

First, the concept possesses semantic features: it is designated by a *term*; and it conveys *sense* and expresses an idea put into a definition that should mobilize its essential characteristics in a coherent and minimal way. Then, the concept possesses a referential feature: it refers to a class of object in the real world which is called the *referent*. The following examples illustrate these three items. Several terms can have the same meaning (they are synonyms, e.g. capital and funds). Conversely, a term can have several meanings (they are homonyms, e.g. capital as a city or as a wealth) [23]. Regarding the distinction between sense and referent, it may be relevant to use the example of the *democracy* concept. It can be defined as a political system in which the power is exercised by the people through elections and other votes: this is what characterizes it. As for the referent, it refers to the class of real-world object that has this characterization (e.g., countries with democracy: Sweden, France, Canada, Japan, Senegal, etc.) [24]. The authors studied the relational links between those dimensions and its implications: particularly the quality of each dimension – *term*, *sense*, *referent* – that determine the degree of clarity and accuracy of the concept. Concepts should ideally be described with an adequate *term* – avoiding synonymy or homonymy – that only has a single *sense* within a given *referent*. Those qualities are essential to (a) define research questions and analysis objects; and (b) to ensure effective communication between actors, researchers, or institutions.

To assess the concept of *health systems resilience* through the lens of *term*, *sense*, and *referent*, we applied semantic analysis techniques to make sense of the multiple definitions. The applicability of this analytical framework has been demonstrated many times by Daigneault to assess various concept strengths and weaknesses (assessment results then taken up by many authors). Other authors have applied this specific conceptual framework (e.g., [Lacouture et al \[23\]](#)) to their own study.

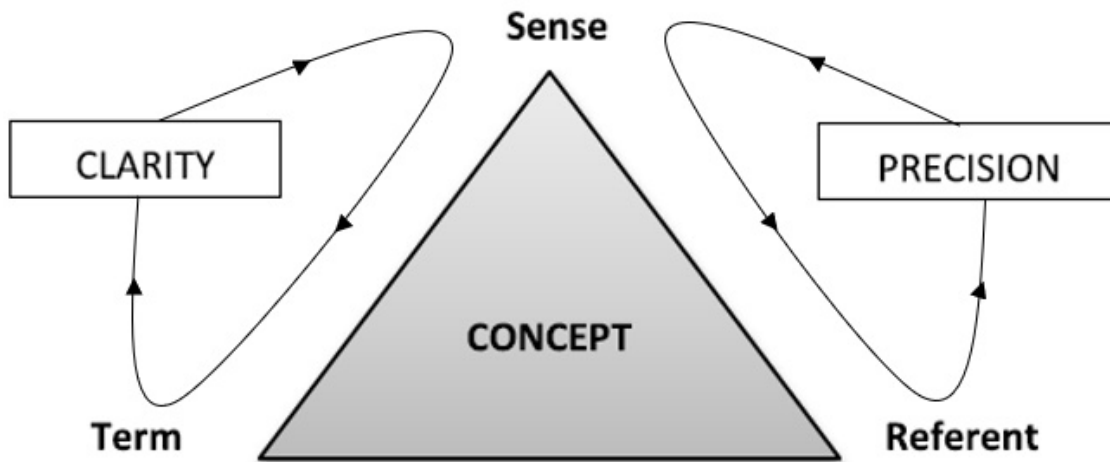


Figure 1 : The three dimensions of a concept (adapted from Daigneault & Jacob [19])

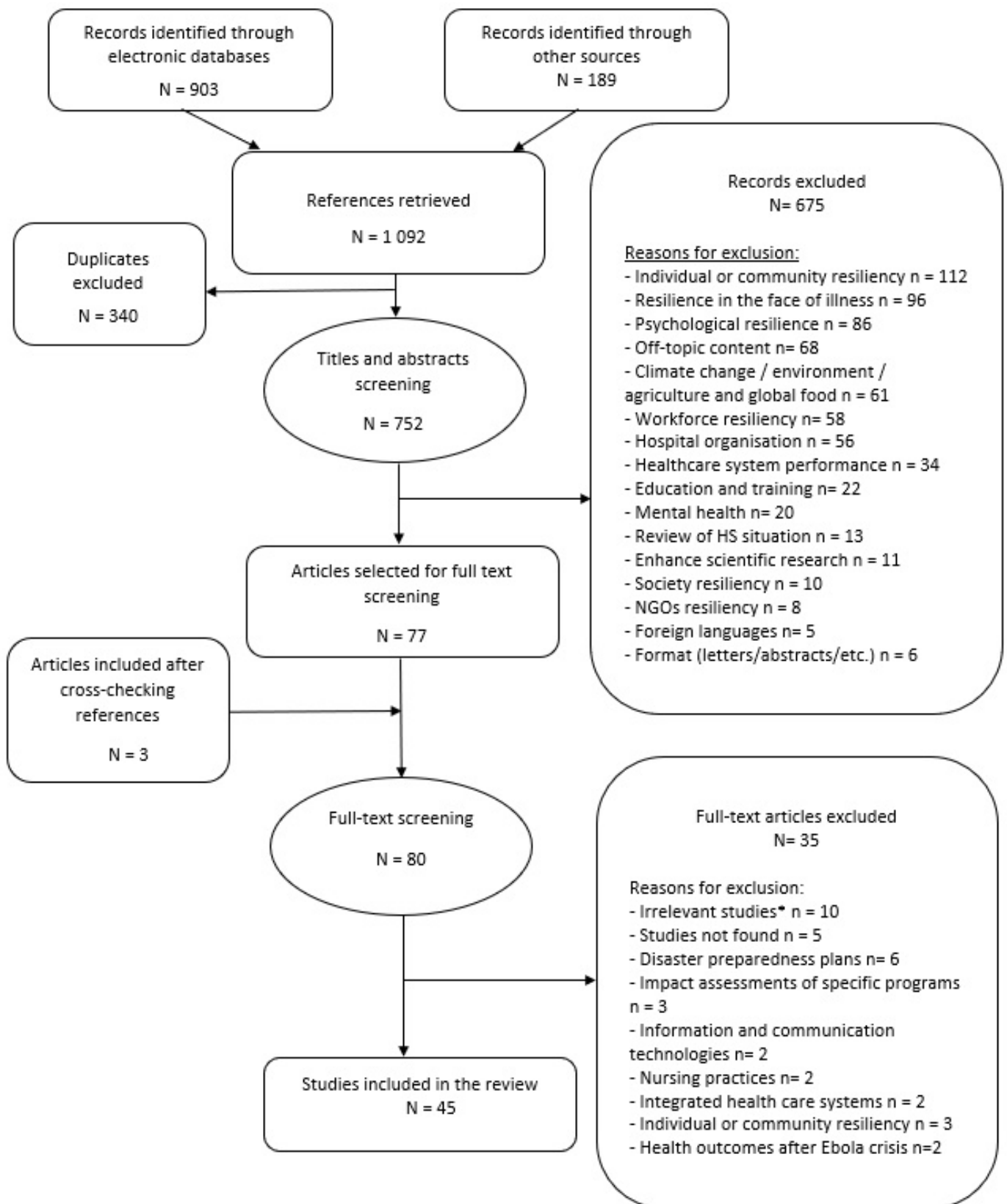
Results

Search findings

Our search strategy yielded a total of 1 092 citations (903 from scientific databases, 150 from grey literature, and 39 from handsearching). That number was reduced to 752 after excluding 264 duplicate records; 77 of these were selected on the basis of their titles and abstract. A final set of 45 articles met all inclusion criteria, and were included in our review. Figure 2 presents the Prisma chart of our study selection process and Appendix 2 includes the characteristics of selected papers.

Despite the absence of date restriction in the search strategy, selected references range from 2006 to 2018, in increasing proportion since 2014 – Ebola crisis – (respectively from 2015 to 2017 : 9%, 13%, 47% of all selected papers). Resilience studies applied to systems have been available for several decades. This growing number of articles reveal the tight connection between resilience and health systems, and the emergent interest in examining this perspective. Of the 45 articles included, 6 provided no definition of health systems resilience. From the remaining articles, 11 defined the term of *resilience*, then applied it to health systems; 17 defined the term of *health systems resilience*; and 11 defined both of them.

Figure 2: Screening process of papers obtained through searches



* References giving no particular information regarding chosen analysis framework; and /or using less than two times the term of *resilience* times in the entire article; and/or developing global system approach without specificities for the health system.

The *Term* of the concept of “health systems resilience”

As mentioned, some authors only defined the concept of *resilience*, then studied it through the health system. [Thomas et al](#) [14] started from research done on resilience of socio-ecological systems. [Thierren et al](#) [25] - citing Boin et al (2010) - defined resilience as the ability of any social system to proactively adapt to disturbances; then, they adapted it to develop their analysis on health systems. In 2013, [Blanchet K.](#) [26] (citing Streefland) understood resilience as a dynamic and multidimensional key process of any system, based on a permanent transformation linked to a survival process. In 2017, [Blanchet et al](#) [27] suggested a conceptual framework - according to the idea that today’s world is a network of systems which interact at different levels of society - to assist health systems resilience management. [Béné et al](#) [17] described the concept of resilience as a holistic way of thinking, in a cross-sectoral approach, to analyze a situation as a whole. [Mills](#) [28] - citing Barasa et al, 2017 – went one step further, and overturned the discourse by arguing that the use of the complex adaptive systems approach - such as the health system – allows us to explore and highlight the weaknesses of the concept of resilience. The author also presented the concept of resilience as another prism for working on health systems issues. While Mills recognizes its usefulness, she also pointed to the fact that this concept could not be used by itself: it needed to be applied along with other concepts. Some authors have used the term *resilience* paired with other related concepts such as *development* [17]; *sustainability* [29]; *robustness* [30] [31]; *innovation* [32]; *responsiveness* [28] [33]; or *security and protection* [34]. They argue that even if resilience represents a new lens of study providing interesting information on health systems, it is not the only one in progress. They therefore associate the concept of health systems resilience with relevant related terms.

In seventeen studies, authors defined the term of *health systems resilience* as a whole. This method of definition led us to express a first concern: are we studying the concept of *resilience*

linked to its object (the health system) or the concept of *health systems resilience*? We might then ask ourselves whether they don't have the same *sense*.

The *Sense* of the concept of "health systems resilience"

Most of the articles focusing on resilience thinking associated to health systems research recognize its dependence to contexts and populations. It focuses on the abilities of different groups (*families/populations* [35] [16] [36]; *communities* [17] [16] [34] [36]; *health workforce* [37] [35] [38]; *institutions/organizations* [35] [18] [16] [36]; *individuals* [16] [36]; *systems/society* [17] [16] [36]) to react in the face of changes (*to cope* [16]; *to anticipate* [36]; *to withstand* [36]; *to bounce back* [39]). The resilience thinking brings us back to different types of resilience in health as explained by Rogers [29] (citing Castelden et al, 2011): *disaster resilience*, *social-ecological resilience*, *infrastructure resilience*, *network resilience*, *urban resilience*, *organizational resilience*, and *community resilience*. As well, it raises the notion of multisectorality over different levels of integration: recognizing the health system as integrated in other systems (political, economic [40], judicial, social, ecological, etc.) and associated with other sectors areas (energy, transport, agriculture, construction, education, climate [41], etc.), including the public / private and formal / informal sectors.

In contrast, the concept of *health systems resilience* analyzed as a whole focuses on the traditional functions of a health system, its conceptual framework, and its capacity to act in the face of changes (*to adapt* [42] or *to prepare* [43] [44] [18]). The word *functions* gets the highest prevalence in our semantic analysis (used in 55% of the definitions) often associated with adjectives *core* [18] [45] [46], or *original* [47]. It appears that the *health system functions* represents a common reference frame and a well-known way of studying health systems. The conceptual framework regularly used is, besides, based on WHO's six building blocks of a health system. However, despite its ubiquity, WHO's vision mainly strengthens the internal function of routine health care service provision and management, and does not incorporate components and attributes to respond to unexpected situations [27] [17] [42]; and so is limited

in building resilience. In addition to these six building blocks, [Blanchet et al \[27\]](#) emphasize that the capacity to anticipate and cope with uncertainties also require access to flexible, adaptable resources. [Olu \[44\]](#) stresses that social determinants such as poverty, lack of good housing, inadequate access to clean water and good nutrition, education, and social protection are imperative for mitigating the risk and impact of disasters for health systems resilience. [Hanefeld et al \[42\]](#) develop a “3 by 2” approach of particular relevance to health systems resilience: three core dimensions corresponding to three WHO’s health systems building blocks, and two cross-cutting aspect which are *governance* as influencing the operation of all building blocks; and *values and beliefs* as shaping response to shocks and how this response is experienced.

The high prevalence of certain characteristics being usually a meaningful indicator of their importance, a semantic analysis of all definitions (41 for *health systems resilience* ; 19 for *resilience* – Appendix 3) was carried out. Often, definitions were closer to a “patchwork” approach with sentences scattered throughout the text, but they allowed to estimate the frequency of commonly occurring words in each given linguistic block ; which were then categorized using a heuristic approach. It is interesting to note that the key elements of the definitions do not focus on the same categories (appendix 4). This observation would suggest that:

- *Health systems resilience* emphasizes the capacity of health systems to maintain their essential functions during to crisis - sudden or expected, internal or external - in order to absorb them;
- The *resilience* thinking associated to health systems study highlights the abilities of different entities to adapt and transform to face destabilizing experiences or shocks.

These definitions differ mainly on : i) the “who” (health systems vs. defined entities) and the “what” (essential functions vs. skills); ii) the type of actions to be taken (maintain and absorb vs. adapt and transform).

Analyzing the sense of each term demonstrates that the definitions are significantly different, though using the same vocabulary. Yet, both definitions are used in all articles by switching from one to the other.

The Referent of the concept of “health systems resilience”

Most of the definitions mention sudden and severe phenomena. The words *shock* and *crisis* are strongly represented across all definitions (respectively 28% and 20%). Mills [28] and Barasa et al [48] even insist on specifying *sudden shocks*. Ammar et al [47] outline their sources: *due to external or internal shocks*; and Blanchet et al [27] provide examples such as *pandemic, natural disaster, armed conflict* or a *financial crisis*. Martineau [49] speaks of *catastrophic events* and/or *experiences*.

Other authors use a broader approach, applying words that indicate less the nature of suddenness and intensity, suggesting that the event can be perceived as a shock but also something much less visible. Kutzin & Sparkes [50] use the word *disturbance*; Béné et al [17] *changes and uncertainty*; Lapão et al [51] and Bayntun et al [52] *challenges*; Haldane et al [53] *slow-burning challenges* and Gilson et al [54] *challenging conditions*.

A wider vision, already developed by Maresso et al in 2013 [32], implies that the relevance of resilience, from a health systems perspective, goes beyond sudden crisis if we consider the myriad of changes that can affect them in a more or less insidious way (e.g. environmental, demographic, cultural, politics, etc.). Lately, more and more authors have shared this point of view. In their proposal of an index of resilience, Kruk et al [18] distinguish sudden shocks, slower moving impacts, and chronic stresses; Barasa et al [48] argue that systems should also be resilient in day-to-day manners in order to face chronic challenges; Razum & Bozorgmehr [55] call *resilience* the health system attribute which allows accommodation to constant changing conditions and unexpected development; Ziglio et al [56] talk about how forecast shocks bring by new challenges or opportunities. Gilson et al [54] develop this standpoint and call it *everyday resilience*, taken up particularly by Barasa et al [48] [43] who define it as the

capacity of the health system to provide quality services in the face of chronic challenges such as structural and policy instability, unpredictable staff, changing patient and community expectations, etc. [48]. *Everyday resilience* is important as it appears to be directly linked to response capacities to sudden events. [Kruk et al](#) [46] call this double improving performance benefit *resilience dividend*: if a health system is able to achieve desired results in the face of chronic stresses, then its ability to respond to sudden shocks can only be enhanced.

This analysis shows that the concept is well built in a tangible frame of reference but with boundaries that are not common to all.

Discussion

Reflecting on main results

The widespread use of the concept of *health systems resilience*, and its mention in the 2016-2030 SDGs, reflect the attractiveness of the concept. This prominence has led to the publication of a profusion of papers. While drawing on three existing – and significantly different - frameworks (WHO – [Kruk et al](#), [Blanchet et al](#)) [57], many authors adapt and improve them when they identify gaps by proposing their own vision and interpretation of this concept. The multiplicity of terms (*resilience*, *health systems resilience*, *resilience of various components of the health care system*, etc.) and specifications create a certain ambiguity that hampers research on this topic. So far, there seems to be no current joint definition of the term (and therefore sense) on which the vast majority of relevant authors agree, particularly regarding the event to face (the referent), its nature and therefore its temporality [58]. This inconsistency raises three important points:

First, the majority use of the three identified frameworks may reflect some degree of thought and research. However, the continuous transformations and enrichment provided by various authors reflect i) a weak convergence of thinking resilience; ii) a lack of reassessment of original frameworks; iii) a “trial and error” process uncondusive of the emergence of a new framework. [Van de Pas and al](#) [57] describe inconsistencies that “reflect an unease or lack of

consensus among country delegations on what the concept (of resilience) offers in advancing the global public health agenda” [57];

Second, the *conceptual maturity* - allowing for operationalization of concepts – is characterized by four main features: (a) consensual definition; (b) clear characteristics; (c) essential preconditions; and (d) and defined limits [59]. In their current form, the different conceptualizations of *health systems resilience* do not meet these characteristics in a clear, precise, and commonly accepted way (through the study of *term, sense, referent*). Therefore, its *conceptual maturity* needs to be further improved to prepare its effective operationalization;

Third, inconsistent use of the term has led to fragmentation of research effort. One way to address this issue is to prioritize the concept of *health system resilience* and increase research cooperation across the field of HSPR to improve its conceptualization. As suggested by [Lallau et al](#) [58], this concept currently shows little or no advantage on the ground. The burgeoning field of HPSR perhaps could be a stepping-stone to increased and improved research cooperation in the future, as this research strand has done on the conceptualization of health systems [60].

Relationship with related terms

To consider a concept is not limited to the assessment of its characteristics, it is also required to determine relationships it has with related terms [19]. Health systems are complex systems made of many components, which may interact with one another. It is intrinsically difficult to model them due to the dependencies and relationships between their components, their environments, or with given systems. Therefore, there are many ways to study their resilience. As explained above, this variance leads many authors to associate the concept of *resilience* with other concepts in order to study health systems: *performance* [14], *responsiveness* [61] [28] [62] [42], *strengthening* [30] [34] [16] [32] [18] [52] [63] [33] [49] [64] [62], and *sustainability* [14] [16] [31] [64]. This is particularly true when the issue of health systems resilience is addressed in programs and policies (e.g. Disaster Risk Reduction, Climate Change

Adaptation, Poverty Reduction, Universal Health Coverage, etc.): implementors then seek to rely on usual field of development aid. Therefore, many programs are designed on a consubstantial notion often presented as an operational means of building resilience : the notion of *crisis management* [65]. We, therefore, were interested in confusion and superimposition that emerged with this specific related term (*crisis management*) and its close one *change management*:

First, *crisis management* is a pervasive concept often linked to health systems resilience for which there is a large number of reports, guidelines, and strategic recommendations depending on context, type of crisis, geographic area, etc. [65]. A resilient health system should know how to manage crisis. Striving to make it resilient will require the creation and use of crisis management tools. Nevertheless, *health systems resilience* in a systemic way seems to be something wider; and *crisis management* is only one of the many instruments to achieve it. As explained by [Kutzin & Sparkes](#) [50], confusion and inefficiency arise particularly when resilience is seen as a program to be implemented: *crisis management* is one part of what we should do, while *resilience* is what we should want.

Second, an organization is constantly subjected to change and the consequences of change: changing environment, policies, techniques, markets, interlocutors, etc. The ability to respond to change represents *change management*. Evolution is universal and [Autissier and al](#) [66] point out that discourses around the need to change or not are no longer relevant; contrary to the ones on how to address these changes to be able to evolve and adapt to the current new global context, which lead us to reflect on change management itself. Considering health systems as particular organizations, we found in their book several notions familiar to the concept of *health systems resilience*. They speak of **transformation** capacity (both of individuals and of the organization) in a logic of **adaptation**. Change appears as a solution to all evolution, and transformation as the way to **anticipate** or **response** to it. Similarities also occur regarding the type of changes mentioned: permanent change (everyday resilience) or sudden crisis, imposed change (SDG to be achieved by 2030) or negotiated change (national

commitment). More than a related term, the concept of *change management* creates a link between *resilience* and *health systems*: resilience becomes the objective of the *change management*, and the health system becomes the organization to change in order to achieve it. In this respect, would it not make sense to conciliate the tools available from *change management* procedures with the terminology of the concept of resilience associated to health systems for more didactic process mapping? This reflection seems to be legitimate if it is considered necessary “to integrate and combine resilience with what we already know and what is already working” [17].

Integration and operationalization of the concept of ‘health systems resilience’

Among our results, 15 are empirical studies, only two of those focuses on routine challenges [54] [67], all others deal with resilience through particular crisis. By combining all countries studied, 6 are high- or upper middle-income countries and 11 are low- or lower middle- income countries. Among Sahel’s countries where our health systems empirical research is conducted, we only studied health services resilience in Nigeria [68]. This limitation certainly shows the need to develop work on *health systems resilience* in this region of Africa, which has been experiencing major crises in recent years, as one of our studies on the effects of attacks on the health system in the capital of Burkina Faso has shown [69].

We also found that most of these empirical researches are qualitative studies. Some use mixed methods by adding questionnaires [63]. There were only two quantitative studies [47] [61]. One of these took place in 2016: [Ammar et al](#) [47] studied Lebanon’s health system during refugee crisis. They were expressing the difficulty to not have “unified definition of health system resilience” and were indicating that “the literature lacks a rigorous and scientifically validated method for measuring and providing resilience in health systems.” They, therefore, decided to use an input-process-output/outcome model of a health system to measure the capacity of the health system while outcomes measure its performance.

Our analysis demonstrates that a common structured definition still does not exist. It seems complicated to expect common measurement tools. At the end of 2017, nevertheless, [Kruk and al \[18\]](#) proposed initial measurements of health system resilience. This *resilience index* is based on their own framework made up of five key characteristics that health systems should espouse: being aware, diverse, self-regulating, integrated, and adaptive [18], all compiled in 25 indicators. This index is meant for measuring resilience capacity of any health system. It does not evaluate simple accumulation of protective factors but a range of actions, and it influences operations at various levels. At the same time, Action Against Hunger (ACF) published a guideline describing eleven steps to carry out health systems assessment with the aim to strengthen them and to develop their resilience [70]. This guideline is the result of collaboration between multiple ACF's workers, Concern Worldwide, two external experts (such as K. Blanchet), various partner organizations, and ministries of health. The seven first steps are timeframe to appraise indicators and information in order to diagnose health system's level of vulnerability. Unlike [Kruk and al \[18\]](#), the objective is not to evaluate the resilience of a health system but to assess and understand its strengths and weaknesses towards determined priority actions required for its development and so contribute to its resilience.

It is encouraging to note that some measurement tools are emerging, proposed by both the scientific community and experts from the field, as initial proposals to respond to the international agencies' call on this subject matter. While it is positive to recognize the similarities between these proposals: the systemic approach and the consideration of different types of changes; it is equally interesting to see how disparate they are. [Kruk et al \[18\]](#) seek to assess the dimensions of the resilience (aware, diverse, self-regulating, integrated and adaptive: intrinsic qualities suggesting that the health system may be comparable to living organisms), when ACF seeks to assess the dimensions of the health system to identify its weaknesses and bottlenecks. This second approach based on system mapping process has been tested in South African context [67]. Authors show that perceptions of the problems affecting the system and how problems affect the system can sometimes be very different from

reality. They are two distinct views/models that each have their drawbacks. On one hand, the interlinked dimensions to manage resilience seems to be far from what is regularly used and known by the field workers, and the Resilience Index has never been tested. On another hand, the Health Systems Building Blocks model – which has broad field presence - was “designated as a tool to indicate options for government investment, and not as an analytic or explanatory model of a complete health system” [60] - its main limitations would be to neglect people and not tackle the structural crisis weakening health systems [60] [57].

Conclusion

In light of these reflections, we conclude that the popular concept of *health systems resilience* remains highly confused. First, the concept of *health systems resilience* is still polysemic [11]: it depends on one’s perception, one’s discipline, one’s function, and what one wants to achieve. Second, depending on how the health system is perceived and the relative importance of its components, dimensions of the resilience may also be different according to users. The review shows that the concept of health systems resilience has not reached its conceptual maturity and, de facto, the various conceptual frameworks used by academics are not commonly accepted and remain fragile. How to measure and understand a reality with unclear boundaries without affecting communication? These variations help to understand why research on monitoring and evaluation indicators remains challenging to conduct. Above all, the following reflection remains: according to systemic approach - current analytical reference method to study health systems - all systems are interconnected and nested to each other’s. Health system is only a subsection of a wider dynamic system that constitutes a State’s organization. Thus, it is closely related to other existing systems (e.g. economic, political, social, climatic, etc.); and the natural question to ask is if the resilience of any of them considered in isolation (like the health system) may really exist.

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Appendix 1: Search strategies for each database

PubMed : (((("resilience"[Title/Abstract]) OR ("coping strategies"[Title/Abstract]) OR ("system responsiveness" [Title/Abstract]) OR ("system adaptation" [Title/Abstract])) AND (("health* systems"[Title/Abstract]) OR ("health systems plans"[MeSH Terms]) OR ("comprehensive health care/organization and administration"[MeSH Terms]) OR ("health policy"[MeSH Terms]) OR ("national health programs/organization and administration"[MeSH Terms]) OR ("efficiency, organizational"[MeSH Terms])) NOT ("Resilience, Psychological"[Mesh] OR "psychological resilience [Title/Abstract] " OR "personal resilience" [Title/Abstract] OR "mental health" [Title/Abstract])) AND (("french"[Language]) OR ("english"[Language]))))

Scopus : (TITLE-ABS-KEY (resilience OR "coping strategies" OR "system responsiveness" OR "system adaptation") AND TITLE-ABS-KEY ("health system*" OR "health* system plan*" OR "health polic*" OR "health system research" OR "national health program" OR "efficien* organization*") AND NOT ("psycholog* resilience" OR "personal resilience" OR "mental health")) AND LANGUAGE (french OR english)

CAIRN : résilience ET système de santé

EBSCOhost (EconLit with Full Text;Business Source Premier;Vente et Gestion) : AB (resilience OR "coping strategies" OR "system responsiveness" OR "system adaptation") AND AB ("health system*" OR "health* system plan*" OR "health polic*" OR "health system research" OR "national health program" OR "efficien* organization*") NOT AB ("psycholog* resilience" OR "personal resilience" OR "mental health")

EBSCOhost (PsycARTICLES;PsycINFO;SocINDEX with Full Text) : AB (resilience OR "coping strategies" OR "system responsiveness" OR "system adaptation") AND AB ("health system*" OR "health* system plan*" OR "health polic*" OR "health system research" OR "national health program" OR "efficien* organization*") NOT AB ("psycholog* resilience" OR "personal resilience" OR "mental health")

ScienceDirect – Elsevier : Title, abstract, keywords : (resilience OR "coping strategies") AND ("health system*" OR "health* system plan*" OR "health polic*" OR "health system research" OR "national health program" OR "efficien* organization*") AND NOT ("psycholog* resilience" OR "mental health")

BDSP : Mcl=([resilience] et [systeme sante])

Google Scholar : +resilience OR "coping strategies" OR "system responsiveness" OR "system adaptation" +"strengthening health systems", -"mental health" -"mental illness" - hiv -tuberculosis -cancer -malaria

OpenGrey : resilience AND health system* AND NOT mental*

WHOLIS : resilience

DUMAS : resilience

Appendix 2: Characteristics of selected papers

Author	Document type	Document design	Location Type of crisis Time	Population/Sector/System	Main Objective
Abimbola & Topp, 2018	Opinion	Editorial	-/-/-	Health systems and Global health	To propose a clear and intuitive definition of resilience that may inform future applications, and to ensure that future discussion and debates in the literature on what this concept brings to health systems and global health are based on a common understanding of the meaning of resilience
Ager et al, 2015	Empirical research	Qualitative study based on 43 structured interviews	Nigeria - Yobe State Boko Haram insurgency 2014	Health managers, local government officials, health facility personnel, patients	To identify key pathways of threat to provision and emerging pathways of response and adaptation
Ammar et al, 2016	Empirical research	Case study methods draws on data from multiple sources	Lebanon Syrian refugee migration 2014-2015	Health system	To assess the resilience of the Lebanese health system in the face of an acute and severe crisis and in the context of political instability To document the impact of the refugee crisis and the health system response in Lebanon
Barasa et al, 2017	Opinion	Analysis	-/-/-	Health systems	To present authors perspective on how the concept of resilience could be re-framed and re-interpreted as everyday resilience, to offer value for health system strengthening

Appendix 2: Characteristics of selected papers

Barasa et al, 2018	Literature review	Review of empirical literature	World - Up to 2017	Health and other sectors	Exploring how resilience was conceptualized, identifying the factors that influence organizational resilience and how they could be nurtured
Bayntun et al, 2012	Literature review	Systematic search of the core literature	World Disaster terms 2000-2011	Health system	To describe the analysis of the worldwide experience of disasters through a health systems approach
Béné et al, 2013	Opinion	Briefing	-/-/-	Policy makers	To explore how policy makers can make the most of resilience
Blanchet et al, 2017	Opinion	Perspective	-/-/-	Health system governance	To present a new conceptual framework on governance of resilience based on systems thinking and complexity theories
Blanchet, 2013	Opinion	Commentary	-/-/-	Health systems	To define the governance of health systems using a resilience perspective, and to present a new conceptual framework
Blanchet, 2015	Opinion	Commentary	Eastern Mediterranean countries - -	Health systems	Comment on Constraints to applying systems thinking concepts in health systems
Ebi et al, 2006	Opinion	Analysis	World Climate changes -	Public health systems	To identify both some modifications to public health systems that may enhance adaptive capacity, and lessons drawn from the history of managing environmental and other

Appendix 2: Characteristics of selected papers

					threats in the public health sector
Farley et al, 2017	Empirical research	Cross-sectional, descriptive, mixed methods study	Sri Lanka Floods -	Medical officers or equivalents	To assess the flood preparedness in healthcare facilities in Eastern Province
Fukuma et al, 2017	Empirical research	Comparative study based on indicator analyzed before and after the disaster	Japan Nuclear disaster 2005-2014	Population -level	To examine population-level health indicator changes that accompanied the disaster, and discuss options for re-designing Fukushima's health system, and by extension that of Japan, to enhance its responsiveness and resilience to current and future shocks
Gilson et al, 2017	Empirical research	Case study methods + meta-synthesis	Kenia/South Africa Instability and daily disruptions Since 2010	Managers and health workers + community	To explore the need for, and nature of, everyday resilience within health systems, considering the routine challenges they face and the strategies employed to address them.
Haldane et al, 2017	Opinion	Correspondence	-/-/-	Health systems	To discuss the definition and exploration of resilience within health systems research as a source of debate
Hanefeld et al, 2018	Empirical research	Comparative Study	Europe/LMIC/West Africa Financial/Climate disaster /Migration crisis 2008/2013-2016/2013-2018	Health system	To determine the extent to which a response to shocks is successful
Kieny et al, 2014	Opinion	Editorial	Guinea/Sierra Leone/Liberia Ebola crisis 2013-2014	Health systems	Reflections on the Ebola crisis in Western Africa

Appendix 2: Characteristics of selected papers

Kluge et al, 2017	Opinion	Analysis	World Major public health threats -	International health regulation and Health system	To look at how and where the intersections between the IHR and the health system can be best leveraged towards developing greater health system resilience
Kruk et al, 2015	Opinion	Viewpoint	-/-/-	Health system	To put forth a proposed framework for resilient health systems and the characteristics that challenge them, informed by insights from other countries that have embraced resilience as a practice
Kruk et al, 2017	Opinion	Analysis	Lebanon/Liberia/Indonesia Population influx/Ebola/ Catastrophic weather events -	Health systems	To support that the concept of resilience adds substantial value to the health systems discourse, and to propose measures of health system resilience
Kutzin & Sparkes, 2016	Opinion	Editorial	-/-/-	Health systems	To facilitate understanding and highlight key policy considerations by identifying critical attributes of each concept and emphasizing the distinction between ends and means in health policy
Lapão et al, 2015	Empirical research + literature review	Literature review + case study methods	African Portuguese Speaking Countries Ebola epidemics -	National and international entities	To address the impact of Ebola epidemics on African health systems, with a special focus on the definition of impact mitigation guidelines and the role of resilience

Appendix 2: Characteristics of selected papers

Leach et al, 2010	Opinion	Analysis	-/-/-	Health governance	To discuss the dynamic, complex and coupled systems involved with epidemics, and to offer a particular analytical approach – a ‘pathways approach’ (Leach et al., 2010) – to addressing epidemics governance
Ling et al, 2017	Empirical research	Qualitative study	Liberia Ebola 2014-2015	Global, national and local actors of the health system	To compare different actors’ priorities for building a more resilient health system and assess how these priorities shaped the response of the health system to crisis
Marezzo et al, 2013	Opinion	Interview	EU member states Global economic and financial crisis -	Stakeholders views	To present the diversity of ideas on what can help health systems in Europe to be resilient and innovative
Martineau et al, 2017	Empirical research	Observational and retrospective research program	Cambodia/Sierra Leone/ Uganda/Zimbabwe/Nigeria Post conflict 2012-2016	Institutions/Health workers/Communities	To analyze health systems reconstruction post conflict and crisis in order to provide guidance for policy makers, donors and others working to strengthen health systems in countries currently emerging from conflict or crisis
Martineau, 2016	Opinion	Commentary	West Africa Ebola outbreak 2014-2016	people-centred approach	Comment on how local, national and global efforts can to improve health system responses better engage with the practice of local health system resilience

Appendix 2: Characteristics of selected papers

Martins et al, 2013	Empirical research	Case study methods	Timor - Leste Political instability 2006	Health workers ; Managers from UN agencies, NGOs, private clinics, associations, Cuban medical brigade	To document and analyze factors that are relevant to mobilizing and retaining health workers to deliver health services during a period of instability
Mills, 2017	Opinion	Editorial	-/-/-	Health systems	To link to the 2016 Fourth Global Symposium on Health Systems Research in Vancouver and reflects the richness of its discussions. The theme was 'Resilient and Responsive Health Systems in a Changing World'
Olafsdottir et al, 2013	Empirical research	Case study methods	Iceland Economic crisis 2008	Key stakeholders in the health sector governance	To analyze the reactions of the Icelandic health system during the first 7 months of the economic crisis in 2008
Olu, 2017	Opinion	Viewpoint	Africa - -	Health systems	To reflect on the nexus between the health system framework and Disaster Risk Management (DRM) and provides insights into how a resilient health system could be used as a framework to strengthen public health DRM in Africa.
Organisation Mondiale de la Santé, 2016	Report	Operational framework	-/-/-	Health systems	To present the Operational Framework for Strengthening the Health Systems Resilience to Climate Change of the World Health Organization

Appendix 2: Characteristics of selected papers

Razum & Bozorgmehr, 2017	Opinion	Editorial	Germany Refugee migration 2015-2016	Health system	To describe the management of refugee migration to Germany through health system approach
Ridde et al, 2016	Opinion	Analysis	Burkina Faso - Ouagadougou Terrorist attack 2016	Health system	To describe the management of the recent terrorist attack from the standpoint of health system resilience
Rodriguez & Aguirre, 2006	Opinion	Editorial	USA-New Orleans Hurricane Katrina 2006	Hospitals	To describe how hospitals prepared for, responded to, and coped with Katrina
Rogers, 2017	Thesis	Case study methods + Document and literature review	Liberia Ebola epidemic 2014-2015	Health facilities and population-level	To draw the importance of system factors to building specific health system capacities and overall health system resilience
Russo et al, 2017	Opinion	Commentary	Africa - -	Health system	To argue that if the continent is to remain committed to the concept of UHC, the associated policies and financial tenets need to incorporate the nature of Africa's non-linear, fragile growth
Shibuya, 2016	Opinion	Report	-/-/-	Global health security	To address the collective challenges the world faces with effective and equitable responses, and to propose three areas for global health action to protect human security around the world

Appendix 2: Characteristics of selected papers

Student Forum Maastricht, 2017	Opinion	Policy proposal	Member states of EU Challenges -	Health systems	The core of this proposal is a framework of guidelines with the overall goal to improve resilience of health systems for all MS of the EU
Therrien et al, 2017	Opinion	Analysis	-/-/-	Health systems	To bring 'public health emergency preparedness' + 'surge capacity in health care' knowledge together to develop a balanced and innovative framework that will help guide efforts to increase the resilience of health systems during crises
Thomas et al, 2013	Empirical research	Case study methods	Ireland Economic crisis 2008-2012	Key decision makers	To develop a framework for assessing the resilience of health systems in terms of how they have adjusted to economic crisis
Van de Pas, 2017	Opinion	Commentary	-/-/-	Health systems	To present outcome of a panel discussion at the symposium in which the resilience discourse and its use in health systems development was critically interrogated
Witter et al, 2017	Empirical research	Mixed methods study using both retrospective and cross-sectional tools	Uganda/Sierra Leone/Zimbabwe/Cambodia Post conflict 2014 - 2015	Health workers	To re-analyses data from the four contexts in order to analyze the impact of different kinds of shocks on health staff (their vulnerabilities)—but also how they coped (their adaptive capacity)

Appendix 2: Characteristics of selected papers

World Health Organization, 2017	Report	Existing literature + Analysis of "on-the-ground action"	Malta Deficits of health workforce -	Health system workforce	To highlight the importance of strengthening system-level resilience to assure optimal and sustainable health systems, particularly in small-population countries where systems can be fragile
Ziglio et al, 2017	Opinion	Editorial	-/-/-	Global health	To clarify the definitions and concepts used in the important task of strengthening resilience for population health and well-being

Appendix 3: Definitions gathered

HEALTH SYSTEMS RESILIENCE	RESILIENCE
Ability to continue to perform and meet its objectives in the face of challenges	Ability of an organization to absorb, adapt, and transform in the face of challenges
Capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learned during the crisis, reorganize if conditions require it.	Ability to draw on personal resources to face adverse circumstances, ensure effective prioritization and protect core functions that will allow to bounce back when the crisis is over
Health actors, institutions and populations being able to maintain core functions and maintain good health when a crisis hits and draw from the lessons learnt during the crisis to reorganize.	Capacity of individuals, families, communities, systems and institutions to anticipate, withstand and/or judiciously engage with catastrophic events and/or experiences
Being able to adapt its functioning to absorb a shock and transform if necessary, to recover from disasters	Capacity of individuals, families, communities, systems, and institutions to anticipate, withstand and/or judiciously engage with catastrophic events and/or experiences
Ability to retain core functions that pursue the defined aims despite the threat or impact of a risk either through prevention or adaptation.	Not just about the ability to maintain or return to a previous state; it is about adapting and learning to live with changes and uncertainty.
Ability to effectively prepare for, withstand the stress of, and respond to the public health consequences of disasters	Capacity of any entity—an individual, a community, an organization, or a natural system—to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience
Ability to protect themselves and human lives from the public health impact of disasters and are critical to achieving good health outcomes before, during, and after disasters	Capacity to prepare for disruptions, to recover from shocks and stresses, and to adapt and grow from a disruptive experience. Resilience is a process; there can be different levels of resilience. Resilience incorporates the concept of emergency preparedness.
Ability to absorb the shocks and sustain the gains already made—or risk having decades of investment wiped out	Ability to "bounce back" and continue to function; predict and prevent potential problems; improvise and recombine resources in new ways; develop a collective and shared vision of dangers and what to do about them; and constantly monitor threatening contextual conditions
Capacity to both survive sudden shocks, such as disease outbreaks, and the ongoing strain of structural, policy, managerial and community instability	Ability...to manage change, by maintaining or transforming...standards in the face of shocks or stresses....without compromising...long-term prospects
Capacity to absorb, adapt, anticipate and transform when exposed to external threats— or forecast shocks that bring about new challenges and opportunities— and still retain control over its remit and pursuit of its primary objectives and functions.	It is a permanent transformation and a process of contextualization and adaptation that is linked to processes of survival and transformation
Ability to accommodate constantly changing conditions and unexpected developments	Maintenance of positive adjustment under challenging conditions such that the organization emerges from those conditions strengthened and more resourceful

To be sustainable and to maintain basic functioning in times of shock

Capability to effectively absorb, respond, and recover from an internally or externally induced set of extraordinary demands

Capacity to react appropriately to moments of crises that have not been entirely anticipated, and the ability to anticipate these crises and to enact, through emergency and disaster planning, changes that will mitigate their effects.

Ability to absorb shocks and maintain services in the face of them

Ability to absorb disturbance, to adapt and respond with the provision of needed services

Capacity to recover—ie, to absorb shocks and sustain gains, often measured through health outcomes

Ability to sustain or improve access to health care services while ensuring long-term sustainability

Capacity to absorb change due to external or internal shocks, maintain original functions and ensure long-term sustainability

Ability to reorganize and adapt to change while maintaining original functions and ensuring long-term sustainability

Capacity to absorb internal and external shocks and maintain functional health institutions while sustaining achievements.

Ability to deal with the shock or stress is based on the levels of exposure, the levels of sensitivity and adaptive capacities

A measure of the amount of change it can experience while still maintaining the same controls on structure and function

Capacity to absorb, adapt and transform when exposed to a shock such as a pandemic, natural disaster, armed conflict or a financial crisis and still retain the same control over its structure and functions

Reduces the vulnerability to crisis, by ensuring that they are better prepared for, and effectively respond, to crisis, while at the same time maintaining the delivery of core healthcare services

Ability to cope with, respond to and reorganize dangerous events, trends or disruptions in ways that maintain their essential functions, identity and structure, while maintaining their adaptability, learning and transformation

Ability to cope with internal and external shocks

Capacity of a social system (e.g. an organization, city, or society) to proactively adapt to and recover from disturbances that are perceived within to fall outside the range of normal and expected disturbances

Capability of individuals and systems (families, groups, communities and even organizations) to cope successfully in the face of significant adversity develops and changes over time

Hold the promise not only of coping but also of strengthening the individual or organization recovering from the shock

Ability to adapt and face resistance from a challenge

Ability of an individual or an institution to withstand and rebound from crisis and adversity

Broader approach to thinking about change and societal responses to it

When they adapt and transform to support the continued delivery of good quality services and wider action to address emerging health needs appropriately

Ability to cope with health risks and manage while maintaining its essential functions, identity and structure

Capacity of health actors, institutions, and populations to prepare for and effectively respond to crises; maintain core functions when a crisis hits; and, informed by lessons learnt during the crisis, reorganize if conditions require it.

All capacities required to be safe, notably the intrinsic ability to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions

Capacity to prepare for and effectively respond to crises while maintaining core functions pre-, during, and post-crisis

Response to shocks and stress may lead to corrections in the institutional design errors that rendered it vulnerable to shocks and stress in the first place.

Capacity to absorb change but continue to retain essentially the same identity and function

Capacity to continue to deliver good quality services in the face of these chronic challenges (structural and policy instability, such as changes in governance structures, payment delays, abrupt and imposed policy directives; unstable authority delegations, unpredictable staff, changing patient and community expectations.). In addition to continuously deliver desirable health outcomes in the face of chronic strain.

Capacity to contend with a health crisis

Continued to function in spite of the challenges

Capacity to manage its way through a crisis

Crucial element to prepare for and effectively respond to crisis

A political strategy to attain 'good enough governance' for health

Ability to respond appropriately to the needs of both health workers and communities they serve during conflict/crisis and in the process of rebuilding

Amount of change a system can experience and still maintain the same controls on structure and function

Pre-existing strong health system as well as its ability to react in a suitable and timely response to an outbreak

Appendix 4: Categorization and frequency of commonly occurring words (%) in definitions of “health systems resilience” and “resilience”

HEALTH SYSTEM(S) RESILIENCE						
Pre-requisites	Entities	Skills	Actions	Subject matter	Time unit	Phenomena
Conditions require	Structure	Ability	Maintain	Functions	During Long term	Shock (Shocks 7; Sudden 2; Internal 2; External 2; Forecast 1) Crisis
Policy	Institutions Services Health actors Populations Community	Capacity	Absorb Sustain Change Respond Adapt Continue Prepare	(Core/Basic/essential/Original) Same control		
Frequency of occurrence						
>50%			Face			Risk
>45%			Transform			
>40%			Retain			
>30%			Reorganize			
>25%			Recover			
>20%			Anticipate			
>15%						
>10%						
<10%						

RESILIENCE					
Skills	Entities	Actions	Subject matter		Phenomena
Ability	Organization	Adapt	Function	Disruptive	Experience
Capacity	Individual	Transform	Resources	Adverse	Shock
	System Community	Maintain Face	Structure	Catastrophic	Events Stresses Challenges Conditions (challenging, threatening)
	Families Institutions Social	Change Recover Cope Process			Dangers Disturbances
Frequency of occurrence					
>45%		Withstand			
>40%		Engage			
>30%		Learning			
>25%		Prepare			
>20%		Grow			
>15%		Emerges			
>10%		Develop			
		Strengthened			
		Bounce back			
		Anticipate			