

Fostering the common good in times of COVID-19: the Responsible Innovation in Health perspective

Promovendo o bem comum em tempos de COVID-19: a perspectiva da Inovação Responsável em Saúde

Promoviendo bien común en tiempos de COVID-19: la perspectiva de la Innovación Responsable en Salud

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The COVID-19 outbreak is one of the most serious public health crises in recent decades. As of June 10, 2020, about 7.3 million cases and 413,000 deaths had been reported officially in the world ¹. Although many countries have succeeded in flattening the SARS-CoV-2 transmission curve, the situation is particularly serious in Latin America, the region that has recently been considered the pandemic's new epicenter according to the World Health Organization. Given this scenario, aggravated by the lack of a vaccine or effective treatment for COVID-19, various solutions have been proposed to combat the disease. Such solutions include tests for screening and diagnostic confirmation ², non-pharmacological interventions at the individual, environmental and community levels to reduce the speed of the virus' transmission ³, and technologies for patient treatment ⁴.

In addition to issues related to the efficacy and security of these solutions, the speed with which they have been developed and made available to the population also raises an important set of ethical, legal, social, economic, and environmental questions. For example, do the diagnostic tests, drugs, and other technologies help reduce or increase the health inequalities? Do the proposed solutions for monitoring citizens violate their fundamental rights to privacy and autonomy? What are the impacts of these solutions on the environment? To what extent are they consistent with health systems' sustainability?

We believe that the perspective of Responsible Innovation in Health (RIH) provides important elements for answering these questions. Firstly, RIH integrates a set of attributes of responsibility that expand the understanding of the value of technological innovations in the health field. Secondly, the attributes emphasized by RIH refer not only to the product itself, but also to the processes of conception and development of innovations and to the organization that produces and makes them available to users. These elements allow addressing the characteristics that condition the innovations' purposes, functions, and costs before they reach the market, and before they are adopted by health services.

We present below the origins of RIH and the elements in its conceptual framework, along with examples of solutions developed recently to fight COVID-19, in order to illustrate some attributes of responsibility that can contribute to decision-making at early stages of health innovations development, when it is still possible to redefine the products' characteristics, development processes, and organizational aspects.

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Contributions of Responsible Innovation in Health in the context of COVID-19

RIH was inspired by the literature on Responsible Research and Innovation (RRI), a field of research that emerged over the last decade under the impetus of innovation scholars and science and technology policymakers. RRI emphasizes participatory and inclusive approaches in the development of solutions that are “ethically acceptable, sustainable, and socially desirable” in dealing with society’s major challenges⁵. More specifically, four procedural requirements are emphasized⁶: anticipation of the innovations’ risks, impacts, and consequences; reflexiveness in relation to the value systems and social practices governing the innovation; inclusive development processes; and capacity to respond to the knowledge, results, and changes in emerging contexts.

RIH can be understood as an effort to adapt the requirements of RRI to the health sector’s specificities. According to Silva et al.⁷ (p. 5), “*RIH consists in a collaborative endeavour wherein stakeholders are committed to clarify and meet a set of ethical, economic, social and environmental principles, values and requirements when they design, finance, produce, distribute, use and discard sociotechnical solutions to address the needs and challenges of health systems in a sustainable way*”. The conceptual framework proposed by these authors (Figure 1) adopts a global perspective for health systems and includes nine attributes of responsibility organized in five value domains, which should be considered throughout an innovation’s life cycle, in light of the context in which the intended users are located.

Population health value

Although a technology that generates individual health benefits is valuable, responsible innovations in health should primarily increase our capacity to meet collective needs⁸ and fight health inequalities⁹. The attributes of this domain are related to the following questions:

- (i) Does the innovation seek to address a relevant health need in the region where its intended users are located?
- (ii) Was the innovation developed considering the available means to mitigate its negative impacts on ethical, legal and social issues?
- (iii) To what extent does the innovation promote health equity?

Considering the pandemic’s severity in Brazil and the world, one can argue that the proposed solutions for fighting COVID-19 address a relevant health need. However, many of them have probably been developed without the appropriate means to mitigate their ethical, legal, and social implications, while the ability to benefit from these solutions varies among users due to their socio-economic situation, social position or individual capabilities. A good example is contact-tracing apps, whose purpose is to encourage self-isolation of persons who have potentially been exposed to the novel coronavirus¹⁰. A recent mapping shows that at least 47 contact-screening apps were being used in 28 countries, and a considerable proportion of them has ethical problems: 23% of the apps did not have a privacy policy, 53% did not disclose how long users’ data would be stored, and 60% did not have publicly declared measures of anonymity¹¹. Besides, access to the necessary media for using these apps is quite unequal, penalizing vulnerable groups with a higher morbidity and mortality due to their identity and the place where they grew up, live, and work.

Health system value

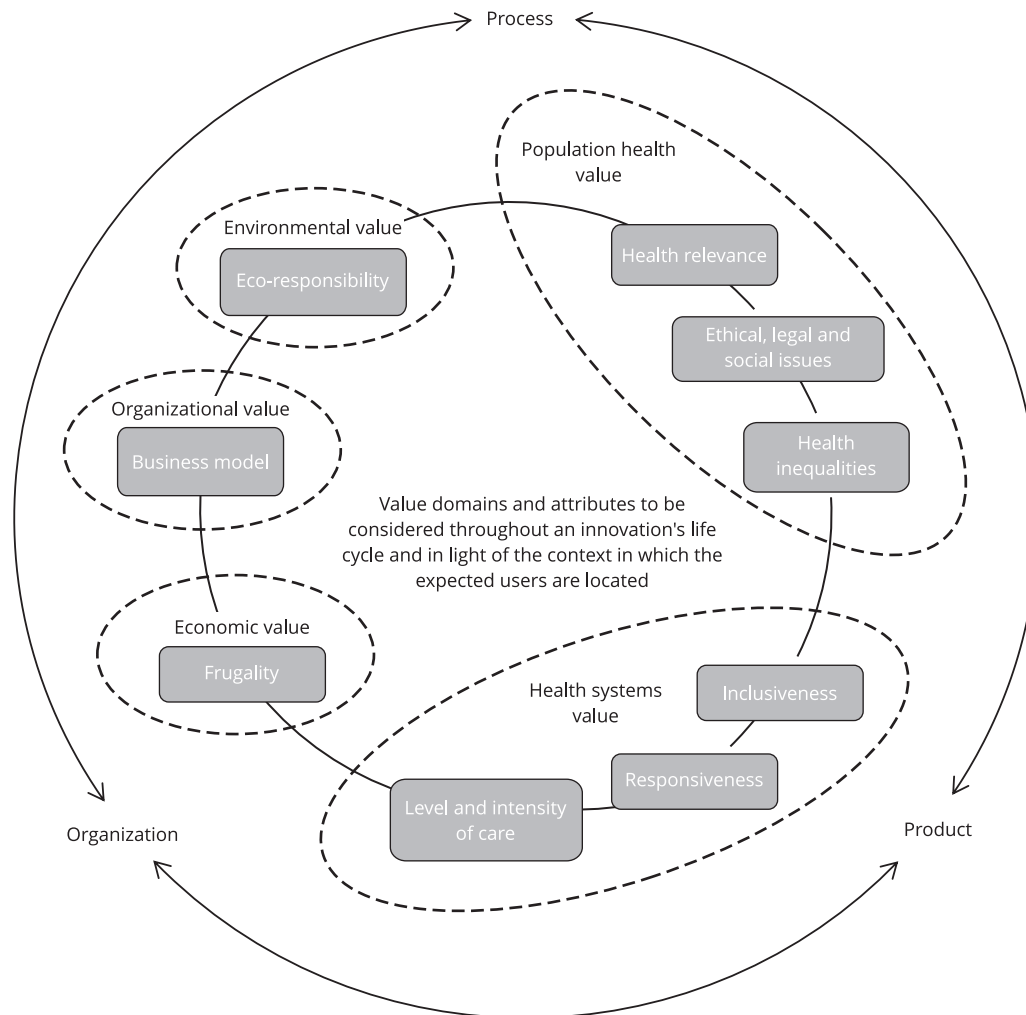
This domain draws attention to the extent to which a solution provides an appropriate response to the various health system challenges¹². The attributes that integrated this domain seek to answer the following questions:

- (i) Did the innovation’s development process engage a diverse and relevant set of participants?
- (ii) Does the innovation provide a dynamic solution to a health system challenge recognized as being of great importance in the region where it will be used?
- (iii) Are the level and intensity of care required by the innovation consistent with the health system’s sustainability?

An important challenge relates to the elderly population living in nursing homes, where the pandemic’s impacts have been particularly severe¹³. To address this challenge, a task force consisting of

Figure 1

Conceptual framework for Responsible Innovation in Health (RIH).



Source: Silva et al. 7.

experts in geriatrics and gerontology, as well as professionals with experience in the administration of long-stay institutions for the elderly, produced a series of contents on the issue, including guidelines for these institutions. All the contents are available free of cost on the initiative's website (<https://www.ilpi.me>) and their implementation can help reduce COVID-19 infection and mortality rates in the elderly. This example shows that it is possible to meet an important need in the health system with reasonably inclusive development processes, while helping reduce the need for mobilizing more specialized levels in the system.

Economic value

This value domain emphasizes the notion of frugality, defined as the ability to provide more values for more people using fewer resources. This ability can be achieved by substantially reducing production costs and costs associated with the use of innovation, focusing on the essential functionalities of

the product and optimizing its level of performance, considering the objective and the context of its use ¹⁴. The genetic test for large-scale detection of the coronavirus developed by the Albert Einstein Hospital in São Paulo (Brazil), based on new generation sequencing technology, is an interesting example of this kind of innovation. The test features parameters that are equal or superior to molecular tests (considered the gold standard for COVID-19 diagnosis), while the estimated cost is lower than that of existing tests and allows processing 16 times more samples compared to the current method ¹⁵.

Organizational value

This domain highlights the business strategies by which a company delivers value not only to the innovation's purchasers and users, but especially to society ¹⁶. The domain emphasizes that hybrid organizations that adopt alternative and economically feasible business models (e.g., making innovation freely usable or exploitable by others, adopting a price scheme based on payment capacity or redistributive logic, employing persons with special needs, and complying with social responsibility programs) are in better conditions to support responsible innovation in health. For example, the global initiative *Hack The Pandemic* (<https://www.hackthepandemic.org>) includes a group of makers, developers, and volunteers who work with healthcare providers to develop personal protective equipment to combat COVID-19. Part of this initiative is a Chilean company (Copper 3D) that develops 3D printing technology with antimicrobial and antiviral materials containing copper particles. Motivated by the shortage of protective masks in Latin America, the company suspended the intellectual property rights on one of its product, namely a mask that is "*reusable, customizable, monoblock, antimicrobial, antiviral, and made with copper nano components*", and released access to the 3D printing files (https://copper3d.com/hackthepandemic/#About_NanoHack).

Environmental value

This value domain highlights the need to minimize the negative impacts of health technologies on the environment throughout their life cycle. Strategies for this purpose include, for example, the use of recyclable and nontoxic materials, efficient energy use, compliance with environmental standards, and the fact that the innovation was designed to be recycled, dismantled, reconditioned, or biologically degraded. Even apparently immaterial solutions such as software packages and apps that use artificial intelligence have a considerable environmental footprint, since they depend on digital devices such as computers, cellphones, and data centers. Two examples illustrate this ¹⁷: waste from cobalt mines, a raw material used to manufacture cellphone batteries, are often dumped directly into the ground water or oceans, with a negative impact on the health of ecosystems and local populations, in addition to soil degradation; and the data centers that host and process huge amounts of data are estimated to produce 2% to 5% of global greenhouse gas emissions. It is thus crucial to consider the environmental impacts of the solutions developed to combat the pandemic, in an approach aligned with the planetary health concept ¹⁸.

Conclusion

The RIH perspective allows examining an integrated set of elements that are rarely considered in traditional approaches to health technologies assessment. However, one challenge is how to deploy this perspective in practice. A recently developed tool enables to identify potentially responsible innovations in health and examine the presence of responsible features based on well-defined attributes, scales, and information ¹⁹. For example, the tool's use allows examining the questions listed at the beginning of the article, that is, to what extent an innovation reduces health inequalities by addressing a vulnerable group's specific needs; whether the means to mitigate an innovation's negative impacts are available for the respective ethical, legal, and social aspects; whether an innovation was designed by integrating eco-responsibility concerns into the different stages of its life cycle; and to what extent an innovation contributes to the health system's sustainability. In the current context, characterized

by the rapid emergence of solutions targeted to fighting COVID-19, the foundations and concepts of RIH invite all actors involved, interested and affected by these solutions to reflect on the attributes of responsibility that foster the common good.

Contributors

H. P. Silva contributed to the drafting, data collection and analysis, critical revision, and approval of the final version. R. R. Oliveira, R. P. Sabio, and P. Lehoux contributed to the data collection and analysis, critical revision, and approval of the final version.

Additional informations

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References

1. Coronavirus Resource Center. COVID-19 dashboard. <https://coronavirus.jhu.edu> (accessed on 10/Jun/2020).
2. Organisation for Economic Co-operation and Development. Testing for COVID-19: a way to lift confinement restrictions. Paris: Organisation for Economic Co-operation and Development; 2020.
3. Garcia LP, Duarte E. Intervenções não farmacológicas para o enfrentamento à epidemia da COVID-19 no Brasil. *Epidemiol Serv Saúde* 2020; 29:e2020222.
4. Ledford H. Dozens of coronavirus drugs are in development. *Nature* 2020; 581:247-8.
5. von Schomberg R. A vision of responsible research and innovation. In: Owen R, Bessant J, Heintz M, editors. *Responsible Innovation Managing the responsible emergence of science and innovation in society*. London: John Wiley; 2013. p. 51-74.
6. Stilgoe J, Owen R, Macnaghten P. Developing a framework for responsible innovation. *Res Policy* 2013; 42:1568-80.
7. Silva HP, Lehoux P, Miller FA, Denis J-L. Introducing responsible innovation in health: a policy-oriented framework. *Health Res Policy Syst* 2018; 16:90.
8. Kindig D, Stoddart G. What is population health? *Am J Public Health* 2003; 93:380-3.
9. Sen A. Why health equity? *Health Econ* 2002; 11:659-66.
10. Servick K. COVID-19 contact tracing apps are coming to a phone near you. How will we know whether they work? *Science* 2020; 21 may. <https://www.sciencemag.org/news/2020/05/countries-around-world-are-rolling-out-contact-tracing-apps-contain-coronavirus-how>.
11. Woodhams S. COVID-19 digital rights tracker. *Top10VPN* 2020; 20 mar. <https://www.top10vpn.com/research/investigations/covid-19-digital-rights-tracker/>.
12. Lehoux P, Roncarolo F, Silva HP, Boivin A, Denis JL, Hebert R. What health system challenges should responsible innovation in health address? Insights from an international scoping review. *Int J Health Policy Manag* 2018; 8:63-75.
13. Rocha C. Qual o impacto da pandemia nas instituições para idosos? *Nexo* 2020; 30 apr. <https://www.nexojornal.com.br/expresso/2020/04/30/Qual-o-impacto-da-pandemia-nas-institui%C3%A7%C3%B5es-para-idosos>.
14. Weyrauch T, Herstatt C. What is frugal innovation? Three defining criteria. *Journal of Frugal Innovation* 2016; 2:1.
15. Colucci C. Einstein cria teste genético para detectar coronavírus em larga escala. *Folha de S.Paulo* 2020; 21 may. <https://www1.folha.uol.com.br/equilibrioesaude/2020/05/einstein-cria-teste-genetico-para-detectar-coronavirus-em-larga-escala.shtml>.
16. Lehoux P, Daudelin G, Williams-Jones B, Denis JL, Longo C. How do business model and health technology design influence each other? Insights from a longitudinal case study of three academic spin-offs. *Res Policy* 2014; 43:1025-38.
17. van Steenberghe É. L'empreinte écologique de l'IA. *Le Devoir* 2020; 19 may. <https://www.ledevoir.com/opinion/idees/579158/1-empreinte-ecologique-de-l-ia>.
18. Whitmee S, Haines A, Beyrer C, Boltz F, Capon AG, de Souza Dias BF, et al. Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation. *Lancet Commission on Planetary Health*. *Lancet* 2015; 386:1973-2028.
19. Silva HP, Lefebvre A-A, Oliveira RR, Lehoux P. Fostering Responsible Innovation in Health: an evidenceinformed assessment tool for innovation stakeholders. *Int J Health Policy Manag* 2020; [Online ahead of print].

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