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Experience reports

Do we need a concept for the overwhelming influence on health of the new technologies? The Digital Determinants of Health proposal

Precisamos de um conceito para a influência massiva das novas tecnologias na saúde? A proposta dos determinantes digitais da saúde (abstract: p. 14)

¿Precisamos de un concepto para la influencia masiva de las nuevas tecnologías de salud? La propuesta de los determinantes digitales de la salud (resumen: p. 14)

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By acknowledging the pervasive effects of New Information and Communication Technologies (NICTs) in contemporary life, this paper reports on the experience and dilemmas of a reflection group on the following question: does the overwhelming and pervasive use of technologies in everyday life, and consequently in health, deserve its own concept for analytical and socio-political prominence? Using Holliday's systematization, the group proposed the concept of Digital Determinants of Health (DDH) due to the need to strongly highlight the action of NICTs in health - both from an epistemological and socio-political point of view. With the suggestion of the concept of DDH, we urge the academic community to engage in a specific debate on the consequences of NICTs in everyday life in order to guide actions capable of mitigating the negative effects and enhancing the benefits of new technologies in health.

Keywords: Social determinants of health. Internet. Telemedicine. Information technology.

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Introduction

We are surrounded by the present use of artificial intelligence for diagnosis, cellular phones as extensions of the body, the manipulation of large databases, as well as the pervasive use of the so-called "internet of things" - with lights, door handles and windows controlled by personified assistants. Computational machines are helping to eliminate the boundary between the internal and external, creating "extended minds" that no longer need their devices[1], as well as a hybrid hyperbody, in which physical and psychological lives are crossed by technoscientific circuits[2]. No wonder the term "fourth industrial revolution"[3] has been coined to describe how technology has transformed our subjectivities, our relationships and our bodies. The effect is also socio-economic: we can see how exclusion from the use of these artifacts has an impact on access to services and care.

A vast array of literature has sought to describe the impact that New Information and Communication Technologies (NICTs) have had on the health sector(g). Among the negative aspects are new forms of abuse in affective relationships, such as controlling and leaking videos and photos[5], as well as cyberbullying[6]. The high frequency of internet use is associated with poor verbal performance[7] and a negative impact on analytical thinking[8], as well as triggering chronic neck and shoulder pain[9], and a higher frequency of headaches in adolescents[10]. Handling cell phones in traffic increases the risk of accidents[11]. In addition, the emergence of new pathologies such as nomophobia and internet addiction trigger a series of symptoms such as sleep disorders, depression, loneliness, stress, neurological changes and low intellectual performance[12,13]. Positive consequences include the use of virtual communities by chronic patients, who find a support network[14], as well as the use of various technologies in programs aimed at rural areas[15]. Sensors associated with healthcare systems have shown potential for elderly care[16]. There have also been advances in telemedicine, with teleconsultation, telediagnosis, teleorientation, telesurgery and teletriage[17]. And during the Covid-19 pandemic, a variety of virtual services have gained momentum, such as online psychotherapy[18] and physiotherapy[19].

On the side of the dubious consequences, we may find the so-called wearable technologies, capable of collecting data from the user's body and providing feedback, such as sensors sensitive to signs of stress, which notify of the importance of breathing exercises[20]. However, this type of technology, while it can generate a "digitally engaged" and empowered patient, raises concerns about the use of the data collected, as well as, to some extent, overburdening subjects with a set of "obligations"[21].

The above is a small sample of the agency of NICTs on the biopsychosocial body. We can see how extensive and pervasive this impact has been - which makes technological influence a field of analysis worthy of attention in the area of health, but does not exclude the fact that this influence coexists and interacts with other forms, such as economic and social ones. So it's not a question of marking a point of absolute transformation - as if we didn't have to live with old problems. We have

(g) The term refers to a set of more specific characteristics of contemporary technologies, such as the intense and pervasive flow of various sources of information[4]

witnessed these changes at various times in history - with the figure of the cyborg[22] inhabiting our imagination for decades. The difference now is the depth, infiltrative nature and speed of these transformations[23,24].

In this sense, the influence of NICTs on health adds to a tradition of analysis that understands the production of health and well-being as the result of multiple dimensions[25]. An important and representative concept of this thinking is the Social Determinants of Health (SDOH). The World Health Organization (WHO) defines SDOH as the circumstances in which people are born, grow up, work, live and age, associated with a broad set of forces that shape the conditions of everyday life: such as political, economic, social and health promotion forces[26]. The SDOH thus considers the production of health as accompanying changes in social structures.

With regard to SDOH, George[27] suggests organizing the concept into four categories: 1) fixed or biological, exemplified by age, gender and genetic factors; 2) economic, such as position in the social stratum and employment; 3) environmental, such as air and water quality; 4) lifestyle, such as diet, physical activity and smoking. Although comprehensive and vast, the influence of NCTIs on health is conspicuously absent from this review. A 2021 scoping review on factors related to SDOH[28] also made no mention of the influence of technology on health in the articles selected. According to the authors, socioeconomic determination was the most prevalent. Other discussions related to social vulnerability were mentioned, such as race, gender, nationality, migration, religion, sexual orientation and disability.

Another notewworthy point is the political dimension of the concept of SDOH, with conflicts expressed in practice and in the field of knowledge. The SDOH are the result of a tension between: a) a public, collective and social health perspective; and b) biological and medical approaches to the production of the health-disease process[29]. The SDOH also face the epistemological complexity of non-linear and highly complex causalities - in which, since there is no direct relationship between cause and effect with a factor to be isolated, the relationships established by the SDOH end up being disregarded and naturalized among so many other aspects considered urgent[30]. Adding to this, there is the social and political complexity of the announced causes, ending up losing graound to causes considered simpler.

As a field of knowledge, new epistemological tensions are emerging, with discussions about the need for a praxeological and material turn in social theory[31-33]. This discussion has been engendered in recent decades by the Social Studies of Science and Technology (SSST), which has demanded that the human sciences also study laboratory and biomedical practices[34,35]. A central idea of this area that has served as a basis for reflection is that technology is the "durable" social; in other words, artifacts that are said to be only technical are also social constructions of such magnitude that their materiality brings together social values that are no longer perceptible after a while because they have been overshadowed by their essentially technical aspect, which is no longer subject to criticism or evaluation[36-38]. In other words, once built, previously socio-technical artifacts do without the prefix "socio" and circulate through social life without being perceived - only technical - and it is only up to man to know how best to use objects that have no specific action in the world.

Thus, under the light of the transformations brought about by NICTs and the coexistence of this advance with historical problems, the thesis of this reflective experience is that a specific look is needed to examine the reconfigurations that this influence engenders. For this analysis, we consider health to be a privileged field of articulation: it is the gateway to human biopsychosocial suffering. Next, we will systematize the experience of a reflection group on the need to establish a specific concept for the influence of NICTs on the population's health and disease processes. This reflection was based on the following research question: "Does the massive and pervasive use of technologies in life, in everyday life and, consequently, in health, deserve its own concept for analytical and socio-political prominence?".

Methodology

Considering our intention to present the influence of NICTs on health, we will use the experience report method, which allows reflection on an experience through a narrative process. In the words of Daltro and Faria[39], the report as a scientific method "performs the experience of the one through language, not as a stable centrality, but as a point of opening and critical analysis" (p. 224).

The narrative about the experience will serve as the basis for a theoretical construction that sparks reflection, dialog and the construction of new knowledge and meanings in the field of health and information and communication technologies. Oscar Jara Holliday's systematization[40] is used to support this construction. The proposal aims to understand the experience, identifying relationships and contradictions, and is organized in five stages: i) starting point; ii) initial questions; III) recovery of the lived process; IV) background reflection; V) points of arrival.

The first stage, the starting point, comprises the moment when the researcher presents his records and notes on the experience, in order to allow for a more comprehensive understanding of what was experienced. The second period - initial questions - is the stage dedicated to defining the aim and object and the axis of the systematization. This systematization refers to the point of the experience that is to be highlighted.

The recovery of the lived process is the stage of describing the process, retrieving the story, organizing and classifying the information that underpins it. Background reflection is the fourth stage and concerns the critical interpretation of the lived process. For Holliday[40], "it is now a matter of going beyond the descriptive (...) to find the reason for what happened in the process of the experience" (p. 88). As the final stage of systematization, Holliday[40] suggests what he defines as end points, in which the researcher presents his conclusions and seeks to disseminate the learning acquired.

We believe that the Holiday stages in the construction of the group's reflective experience contribute to the organization, linearity and presentation of thought in a more systematic way. However, these stages were experienced simultaneously and, in the narrative process, they merge at times. This occurs primarily in the stages of starting point, recovery of the lived process and background reflection.

Results and discussion

The starting point

The trigger for this experience was a course held in 2022 at the National School of Public Health (ENSP) at the Oswaldo Cruz Foundation (FIOCRUZ) with the aim of promoting a critical debate on the different trends and challenges of NICTs in the field of health. The discussions and reflections were based on the book "Internet and Health in Brazil: Challenges and Trends"[41].

The course was attended by 23 higher education professionals from different fields of training and work, involved in research in the area of the Internet and health. Synchronous online meetings were held in which the authors of each chapter presented their theoretical constructs, studies and research, and then addressed questions, experiences and perspectives brought up by the participants. Finally, there was a wide-ranging debate on how NICTs - with all their technological and interaction possibilities - could influence, condition and determine health and illness processes in society.

During the five days of the course, various topics were debated, such as the history of the internet; online citizen participation; health on the social web; digital literacy; innovation models, among others. The discussions were powerful enough to highlight the use of NICTs as possible health conditioning factors and the need to establish a specific conceptual proposal. The assumption for the proposal came from the debates, in which it was possible to identify different contemporary conditioning factors capable of modulating the state of health of individuals in a concrete way - in some cases, with direct causality. Issues such as cyberbullying, the influence of digital exclusion on access to services, postural problems, excessive screen exposure, the impact on social relationships, etc. were brought up.

As an alternative to keep the debates going, an interdisciplinary reflection group was created, formed by some of the course participants and also by new researchers, invited by the initial members when they became interested in the topic. We started meeting every two weeks to discuss the relevance of the DDH, possible theoretical foundations and new proposals for dialog with the DDH. As a way of recording the discussions held at the meetings, we opted for an online tool for shared editing of the writing.

Initial question

Recognizing the use of NICTs as the core of our discussions - based on their multiple influences, determinants and correlation with health - we defined the following question to guide our discussions and meetings: "Does the massive and pervasive use of technologies in life, in everyday life and, consequently, in health, deserve its own concept for analytical and socio-political prominence?" The question was formulated to stimulate reflection from the outset on whether the concept of SDOH would be sufficient to analyze and guide specific actions on the influence of NICTs on health. We understand a concept to be an expression capable of reflecting mental operations constructed in dynamics with reality and also of systematizing

the content of a theory[42]. Regarding the definition of the concept, this need arose, among other factors, from the perception of a pervasive and capillary entry of digital in contemporary times, with a pronounced impact on health. In this questioning, we recognize the concept of Digital Health, which also considers that specific aspects of technologies require a particular approach. On the basis of these questions, we are now advocating the adoption of the concept of Digital Determinants of Health (DDH), understanding the need to place greater emphasis on the action of human and non-human factors in the production of health - both from an epistemological and socio-political point of view. We will demonstrate below how we defend this point.

Recovery of the lived process and background reflection

During the group meetings, questions were raised about the need and feasibility of proposing a specific concept for analyzing the relationship between NICTs and health. At each meeting, topics were debated that could contribute to further deepening and grounding our reflections and constructions. As we pointed out earlier, the stages of systematization proposed by Holliday[40] intersect throughout the description of our experience.

Initially, we carried out a review of the SDOH, reading systematic, narrative and scoping reviews. The next step was to revisit the classic models of social determinants that discussed the health-disease phenomenon as a process determined by the relationship between the state, the economy, society and health; it was found that the SDOH included cultural and environmental characteristics that organize and constitute the territory of different groups, impacting on their health, quality of life and well-being. In this logic, the SDOH are associated with the notion of equity/iniquity in health, since they impact differently - and often unfairly - on the health of individuals, social groups, communities and the possibility of access to protection and care for life[29]. Despite the comprehensiveness and complexity of the models, what we noticed was an under-representation of NICTs as conditioning factors and determinants of individual and collective health processes today. Most of the articles did not mention the influence of NICTs on health, with one of them defending the idea that the SDOH should now deal with the notion of digital determination[43].

The group agreed that the SDOH already had a broad discussion on non-biomedical health determinants. The reflection, however, concerned the extent to which such a broad approach could deal with very specific aspects of the field of NICTs. At the other extreme, there was also concern about the possibility of devaluing a term that already had its own history, field and defense. The SDOH proposal, back in the 1970s, was an important step towards recognizing the limitations of the biomedical model[44]. In addition, there was a question mark over the possibility that the digital conditioning factors were already included in the existing models.

Based on this debate, the proposal was to produce an article that would provide subsidies for the influence of technologies under the aegis of the SDOH. This option, however, could invalidate the discussion on digital determination,

since the SDOH already include a very complex field of determinations ranging from the environment to sanitation, including inequalities, gender, class and race determinations. From this, the importance of establishing a concept for the influence of NICTs emerged in the discussions, and the concept of Digital Determinants of Health (DDH) was proposed. The term "digital" was chosen because we believe it represents NICTs in a more recognizable way. One of the definitions of "digital" is a device that "works exclusively with binary values", such as computers or cell phones, or something that "originates from such a device"[45]. Binary is a language made up of 0 and 1, capable of representing any information.

One of the group members also brought up another factor about the DDH: the fact that they were anchored in a materiality and in new technologies - which made them, in theory, more than simply "social". We turned to the philosopher Bruno Latour to establish a theoretical framework to help us problematize this aspect[36,46]. One notion that caught the group's attention was Latour's discussion of the so-called "modern constitution"[36,46], which establishes that a type of science with an overemphasis on empiricism was born out of a "false agreement" in which nature would be separated from culture. From this division came multiple disciplines, each with an object: the human sciences would deal with criticism and "human error", and the biomedical and natural sciences would deal with materiality and facts, thus limiting the complex approach to phenomena, in which both aspects are not separate. As a result, the criticism leveled by the human sciences, for example, would never really bring about change, as they are independent disciplinary fields with little dialogue between them.

Another aspect that mobilized the discussion was the concept of "hybrid", also by Bruno Latour[36,46], material objects; which, although essentially non-human, have an action in the social world and circulation in the community, and the political and social effects they produce are evident. With similar ideas, another author who contributed to our discussions was Andrew Feenberg[38], for whom materiality is not opposed to the notion of social values. For this author, technical knowledge is just a specific type of language that also represents values - which reinforces Bruno Latour's notion of hybridity.

Based on these ideas, we wonder to what extent the phenomenon of digitalization in health is configured as a hybrid object. In other words, it's not just on the side of materiality, nor just on the side of culture; it straddles the fields. For Latour, hybrids have challenged the modern constitution, so that contemporary science is forced to consider interdisciplinarity in order to deal with these aspects that require different specialties. We have thus come to the conclusion that DDH are hybrids par excellence (they have a strong material component, but are also imbricated in human relationships). This gives DDH a different status from SDOH, at least in the way the concept has historically been articulated in the field of public health, as more associated with social vulnerability, without much articulation with materialities[28].

At this point in the discussion, the group engaged in a long debate that lasted for several meetings and, just when we thought we had closed the discussion, someone would raise the question again, which can be summarized as follows: as a way of encompassing the complexity of today's reality, in which social ties between humans and machines are evident, should we make an effort to think of a concept

that is more interdisciplinary, and not just a reinforcement of materiality; what is the "digital" component in DDH? Temporarily, the suggestion of Hybrid Determinants of Health was made so that the problems encountered in determining the health-disease process would be more integrated. The concept remained established for a few meetings until we were crossed by other needs, which went beyond the theoretical and epistemological.

Points of arrival

After heated discussions about the theoretical need to emphasize hybridity, the group raised the question as whether the concept chosen, Hybrid Determinants of Health, would bring political and social indeterminacy about the social dynamics of health determination; and, even more so, whether such hybridity could have the opposite effect to that intended; namely, that of overshadowing the factor that originally sparked our reflection: that of digital determination. After all, the aim of the meetings was for the participants to agree on the need for a more specific classification of the influence of NICTs on the production of health in contemporary life. It was emphasized that the "hybrid" concept is interesting from an epistemological and methodological point of view - in that it highlights the multidetermined dynamics of health, highlighting not only the social aspect, but also the material and the broad connections and determinations caused by the varied encounters of materialities, subjects, bodies and values. But, in practice, what does the notion of hybridity convey to health practice and political decisions in the field? What guidance does it bring to mitigate the negative impact of these technologies on health today, both in its individual and collective aspects?

Bearing in mind that one orientation of science, in addition to producing evidence, is to generate ideas that guide human actions, we return to the concept of DDH. The return to this concept was not without its doubts; after all, highlighting specific parts of the health production process seems, at first, to reinforce a fragmented and reductionist analysis. The group's paradox lies precisely in the following point: admitting the coexistence and interrelationship of countless health determinants, but bringing in a specific reflection on NICTs and their relationship with health levels.

However, considering the notorious under-representation of possible digital determinants in the discussion on health determinants, the concept was defended not only from an epistemological or methodological point of view, but also from a socio-political point of view. In the group's view, the socio-historical moment requires a specific look at the pervasive way in which the socio-technical dimension enters everyday life - not in order to foster an impossible world in which technology is absent, but so that, considering technology as the result of the social and of materialized values[37,38], artifacts that contribute to health can be materialized. Drawing attention to digital determination is important to us because it helps to deconstruct the notion that technology is inert and that man's intentionality is enough to define its effects; in other words, that the consequences of technology on health depend only on man's awareness so that he can make the best choice about how to use it.

The group rejected this notion. Although human choice over technology and technological education are both important, it was considered that NICTs have such a capillary action in social and mental life - and some aspects have been designed precisely to inhibit choice - that our intentionality is clearly affected. For example, when a feed on a social network is designed to be infinite, making it difficult to take the initiative to leave that network, we are talking about an object whose configuration has a significant impact on the autonomy of individuals; therefore affecting their decision-making capacity. Therefore, the idea of digital determination highlights that technology can both facilitate and hinder choice - a highly relevant factor for the production of health. Finally, we believe that the concept is supported by the academic community. The DDH were defended through the publication of a preprint of this article in August 2023[47], which reached 159 downloads by June 2024. Another article presented the proposal in January 2024[48]. These facts show the interest in the topic and support its defense.

Final considerations

Through a reflective process that considered the literature and existing notions; however, in view of the need for a concept that aims to strengthen the link between health and NICTs, the group proposes the use of the notion of Digital Determinants of Health (DDH) and its further development in subsequent studies. For this formulation, we considered the varied effects of technology on health: altered sleep patterns, chronic pain, depression, but also patient empowerment, telemedicine in remote locations, the use of "wearable" equipment for feedback based on breathing measurements, etc.

We notice the relevance of concepts such as SDOH, which take on the important task of accounting for non-biomedical determination in the production of health. However, we note the under-representation of digital determination in these discussions. With a focus on social vulnerability and having to deal with a wide range of categories including social class, race, gender, among others, we believe that placing the digital under the umbrella of SDOH could overshadow the attention needed for epistemic, political and social action on the complex and hybrid processes that materiality imposes on us today. This does not mean that DDHs cannot be articulated with other social markers. It is up to this group and the academic community to deepen the concept based on categories of class, gender, race and their intersectionalities, as well as the global and unequal dynamics of technology. A specific look at DDHs, articulated with these factors, can also contribute to broadening the discussion on equity in digital health. Thus, since technology is values and sociabilities made durable, we advocate a specific look at the construction of technical artifacts - reiterating the adoption of the concept of DDHs - for a look at a phenomenon that has contributed greatly to the production of health in contemporary life with effects that cannot be overlooked.

Authors' contribution

All authors actively participated in all stages of preparing the manuscript.

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Reconhecendo os efeitos pervasivos das Novas Tecnologias de Informação e Comunicação (NTICs) em todas as esferas da contemporaneidade, este trabalho relata a experiência e os dilemas de um grupo de reflexão sobre a seguinte pergunta: A utilização de tecnologias de modo massivo e pervasivo no cotidiano e, consequentemente, na Saúde, merece conceito próprio para destaque analítico e sociopolítico? Por meio da sistematização de Holliday, o grupo propõe o conceito de Determinantes Digitais da Saúde (DDS) pela necessidade de evidenciar com força a ação das NTICs na Saúde — tanto do ponto de vista epistemológico quanto do sociopolítico. Com a sugestão do conceito de DDS, exortamos a comunidade acadêmica a um debate específico sobre as consequências das NTICs na existência cotidiana para a orientação de ações capazes de mitigar os efeitos negativos e potencializar os benefícios das novas tecnologias na Saúde.

Palavras-chave: Determinantes sociais da saúde. Internet. Saúde digital. Tecnologias da informação e comunicação.

Reconociendo los efectos penetrantes de las Nuevas Tecnologías de Información y Comunicación (NTICs) en todas las esferas de la contemporaneidad, este trabajo relata la experiencia y los dilemas de un grupo de reflexión sobre la siguiente pregunta: la utilización de tecnologías de modo masivo y penetrante en el cotidiano y consecuentemente, en la salud, ¿merece un concepto propio para un destaque analítico y sociopolítico? Por medio de la sistematización de Holliday, el grupo propone el concepto de Determinantes Digitales de la Salud (DDS) por la necesidad de poner en evidencia con fuerza la acción de la NTICs en la salud, tanto desde el punto de vista epistemológico, como del sociopolítico. Con la sugerencia del concepto de DDS, exhortamos a la comunidad académica para realizar un debate específico sobre las consecuencias de las NTICs en la existencia cotidiana para la orientación de acciones capaces de mitigar los efectos negativos y potenciar los beneficios de las nuevas tecnologías en la salud.

Palabras clave: Determinantes sociales de la salud. Internet. Salud digital. Tecnologías de la información y comunicación.