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# Dengue Data and Public Information: An Agency Theory Perspective

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**ABSTRACT**

The paper reflects on public health information management problems affecting public servants during epidemic outbreaks of dengue and similar diseases, based on the application of Agency Theory. It aims to broaden the scope of studies in this field, approaching the subject from a new perspective. The discussion is based on a broad bibliographic review of areas related to Agency Theory, case studies about dengue and public health. Application of Agency Theory to public health and to epidemic situations anticipates an intrinsic contradiction within the traditional health management model, dangerously affecting the efficacy of surveillance systems and impacting the insufficiently satisfactory results of the combat against vectors. It is possible to control this phenomenon using information technology from the perspective of self-organization and community information, with a view to training and empowering both citizens and non-governmental organizations with

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transparent, open-access data. Mobile technology offers possibilities for this type of endeavor.

**Keywords:** Public health; dengue; information technology; Agency Theory ; community informatics.

## INTRODUCTION

Over the last two centuries, dengue silently became a global threat of overwhelming growth, which has returned to the territories of countries such as Japan or Singapore, where it had disappeared many decades ago. [1-6] Public policies for monitoring, control and containment of these epidemic outbreaks seem to suffer from various management problems at all levels, [7] and although this situation is visible, epidemiological studies in the area continue to be dominated by a biological perspective, in which the focus of attention is limited to the dynamics of the vectors and the virus, but the analysis of the informational phenomena involved, as well as the information asymmetries that accompany them, is neglected. This article aims to reflect on these problems during epidemic states, applying the Agency Theory to the information management of public servants, elected and career. In this way, we seek to broaden the perspective of public health studies, and provide a fresh perspective on this issue.

An example of this situation could be the undeclared dengue epidemic that occurred in the Alta Paulista region, in the state of São Paulo, Brazil, during 2014. Despite the existence of an evident epidemic condition, a species was created of "pact of silence", in which the political and medical authorities and the media provided *slogans* and *light* information , while systematically avoiding any data that could indicate the seriousness of the situation. This situation was denounced

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by the Paulista State University (UNESP) during a public debate that took place in the city of Marília, in March 2015, with the presence of members of the Public Ministry, regional hospitals, health and surveillance centers, NGOs and civic associations. The event generated a document titled "Letter to the community: answers, considerations and provisional conclusions to continue the debate." [8]

In this document, the dengue outbreak was attributed to the lack of responsibility of public managers, who lacked organization, strategies and effective measures. Neither the population nor the health bodies were prepared to face the epidemic, and both decisions and actions failed to keep up with the pace of events. The inability to create and conduct the mobilization of citizens in general prevented the escalation of effective control measures against the vector.

It is essential to rethink the public health model, since these types of diseases are a social problem that advances due to the lack of transparency of government actions, since information and knowledge do not flow outside the public administrative system, which creates " "different versions" about the state of the epidemic situation, under-registration, low quality of data, as well as lack of awareness and citizen control. But in order to rethink the public health model in the face of threats such as dengue, it is necessary to reconceptualize our ideas regarding what is understood as an "epidemic", and analyze public management errors from a different perspective. This article proposes to consider dengue epidemic outbreaks as an informational phenomenon, associated with the inefficient construction of dialogue mechanisms between citizens and authorities, due to the existence of perverse incentive systems that favor the construction of information asymmetries. In this regard, the application of the Agency Theory to

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Public Health and the epidemic situation allows us to understand that there is an intrinsic contradiction within the traditional health management model, which dangerously affects the effectiveness of surveillance systems. In the case of dengue and similar diseases transmitted by various vectors, which could be controlled by the synchronized and joint action of the population, this phenomenon affects the unsatisfactory results in the fight against vectors.

## AGENCY THEORY, RISKS AND CONTROL COSTS

Agency Theory was born from the works of *Ross* , *Mitnick* , *Jensen* and *Meckling* , [9,10] which attempted to explain the vicissitudes of the relationships between professional administrators and the owners of the organizations managed by them. The existence of professional administrators or managers emerged during the birth of large North American corporations at the beginning of the 20th century. The existence of professional managers in charge of managing companies on behalf of their owners became something typical of Western capitalism, to the extent that great entrepreneurs like Ford or Rockefeller gave up personal control of their businesses. [11] The phenomenon of agency arises from the difference of interests between the owners of the enterprises and those who manage them professionally, within a situation of globalization that, increasingly, tends to place these two groups (the owners and their representatives administrators) in distant locations, and hinders the flow of information between them. For this reason, the phenomenon of agency is at the very heart of the current economy, which acts supported by the structure of a global network society, [12] characterized by distant property and exploitation

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relations called Distributed Capitalism, [13] supported by the "suitability " bureaucracy of local professional administrators.

Agency Theory includes economic-legal elements, such as contracts, incentives and management controls. It also includes institutional elements such as the organizational structures in charge of regulating the actors involved in contracts. Finally, it includes behavioral elements, since it establishes a relationship between the actions and risks assumed in the contractual relationship of the parties; This relationship will depend on the strength of the incentives to favor the acceptance of certain types of risks and actions. From this behaviorist point of view, Agency Theory considers human action as a response derived from the contingencies that motivate or restrict certain actions and, therefore, the moral dilemma, in this case, is reduced to the capacity of the current contracts to protect the interests of the owners, and ensure the maximum diligence of their representatives in the administration of the assets that are placed under their responsibility.

For Agency Theory, every relationship, formalized or not, is presented as a contract that defines a series of incentives that can be negative or positive. The central relationship is the delegation of power that an owner called "Principal" makes of the control of his property, to a representative who in this case is called "Agent", who acting on his behalf should pursue the benefit of his interests. Common sense applied to this relationship implied, somewhat naively, that in the relationship between Principal and Agent there would always exist a community of interests, safeguarded by the moral principles of the Agent and the excellence of the audit control exercised by the Principal. In fact, Agency Theory

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accepts that contract fulfillment is regulated by social institutions, some formal such as law and organizational norms; other informal ones such as culture or values. Both, in a complementary way, try to channel the Agent's action. However, Agency Theory departs from common sense when it states that all control is incomplete, a situation that leaves room for the Agent's covert action, based on two main elements:

- The existence of information asymmetries between the Agent and the Principal.
- The existence of control costs that make the exercise of complete supervision impossible.

Information asymmetries are explained by the proximity and control that the Agent has with respect to the facts and data that could inform about its behavior, a situation that allows it to filter and manipulate what would be perceived by the Principal and its control bodies. as "inconvenient". On the other hand, there is a relationship between the extent of control exercised over the Agent's actions and the cost that this control entails. The cost of the exercise of control by the Principal over the Agent begins to rise exponentially to the extent that this control approaches its absolute level, and becomes so onerous that if forms of total and perfect control existed, these would be so expensive that they would consume the profit margin they could produce in the form of risk and loss reduction. In other words, it ends up being more expensive to control the Agent than what is saved in risks, and benefits improve with that control. It is cheaper to assume the expected losses due to the Agent's negligent or unethical conduct than to pay to permanently audit his behavior. Due to the above, there will always be risks of misconduct on the part of Agents, and the object of research on agency phenomena will be to

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understand how to formulate more balanced systems of contracts and incentives, to obtain an efficient relationship between control and delegation. .

AGENCY RISKS IN THE GLOBALIZED NETWORK ECONOMY

At the end of the 20th century and with the rise of globalization, the Agency phenomenon was extensively studied in private organizations, where the role of Principal was played by shareholders, and high-ranking professional administrators such as company Presidents, CEOs and the like. , they function as Agents. However, it was quickly concluded that this phenomenon was transversal to all types of organizations and activities in society. [14] With the development of Distributed Capitalism, the Agency phenomenon became a central problem of the globalized Information Society. The Agents were left in a position to create enormous information asymmetries, since their control of data sources was absolute. The problem of the cost and imperfection of surveillance skyrocketed and for this reason, Agency Theory became more relevant than ever in its study of the structures of delegation "contracts", and the balance between incentive structures and agency costs. [fifteen]

It is important to understand that in this perspective, the moral dimension of the Agent's actions is not analyzed; The level of economic damage that this action may cause to the interests of the Principal is studied, as well as the costs of controlling it. Agency costs will be the expenses caused by the need to monitor the Agent, or defray the pecuniary damages that its actions may cause to the interests of the Principal. In Agency Theory, understanding the mechanics of delegation relationships is the way to anticipate agency risks, and thus intervene in its different costs and risk to preserve the sustainability of the interests of the

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Principals. Since the globalized network society is a society of organizations that act under the principle of remote division of work, the Agency phenomenon has an enormous impact, since each bureaucrat or specialist within their plot of management and power in the division of labor, is a potential Agent, with all the moral and technical risks that this implies. In our society, someone (an expert or bureaucrat) is constantly doing something specialized for another person by delegation. Thus he ends up representing interests different from his own: the mechanic checks and fixes the car on behalf of the driver; the doctor listens to a patient's body at the request of the patient himself; The politician manages the public administration for a citizen through the direct or indirect choice that the citizen makes. The risks involved in the Agency phenomenon are two: [15]

1. *Moral risk* , which refers to the opportunistic action of the Agent, who tries to take advantage of the Principal. The concept of "opportunism" was formulated by *Oliver Williamson* [16] to describe the tendency of economic agents to act in their own interests, regardless of the harm that this could cause to their counterparts or third parties.

2. *Technical risk* , which refers to the incompetence of the Agent with respect to the assigned tasks, which may go unnoticed at the time of initial contracting, as a consequence of an erroneous evaluation and/or of the Agent's ability to project a image that hides your professional weaknesses. The Principal hires the Agent convinced that he has certain abilities that he never actually manages to fully verify, until the Agent is already working. Perceiving the Agent's technical inability can take time and lead to irreparable damage.

AGENCY AND INFORMATION RISKS

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In either of these two cases, moral or technical risk, the control of agency risks depends on the provision of reliable information that allows determining whether the contract is being respected or not, and whether the Agent's conditions are those that were anticipated at the time. of his hiring. However, obtaining information is complex and expensive, and that is why the agency phenomenon leads to *trade-offs* or zero-sum elections: to gain something you have to lose something. The Principal will never have all the information about what his Agent is doing, and with that he may have losses. But if he tried to obtain complete information, the costs of surveillance and control would increase to levels at which it would not pay to delegate administration, and the Principal would have to do everything on his own, a circumstance that is impossible in a complex world like today's.

In conclusion, since neither agency costs nor risks can disappear, the solution is to empirically investigate efficient ways to anticipate and evaluate their incidence. The solution proposed by the Agency Theory is a combination of incentives and controls that reduce moral and technical risk, combined with relevant, reasonably reliable and low-cost information structures that can efficiently guide the control of the Principals. And as relationships between Principals and Agents evolve to change according to their context, a permanent negotiation system is necessary to adjust common interests, risk perceptions, and decision styles. That is, defining what are the tolerable risk levels to guarantee the well-being of both Principals and Agents.

From the informational point of view, the agency phenomenon is affected by any behavior that compromises data flows, since these flows allow the Agent and the Principal to approximate their interests based on reliable facts. [17] If there is a

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relatively free flow of reliable information, the evaluation of the performance of the Agents, the reasonableness of the demands of the Principals, and the ways of harmonizing the objectives common to the two, will be more realistic and better monitored. The perception of the moral and professional profile of the Agents will also be more adjusted. In the absence of quality information flows, opportunism invades the system and asymmetries increase. This puts the survival of the entire group at risk.

## AGENCY, PUBLIC ADMINISTRATION AND HEALTH

Taking into account that democracy implies a "contract of delegation of power" between the voting citizens (the Principals) and their elected representatives (the Agents), the Agency Theory is applicable to public management. And it not only involves elected representatives, but also career officials, who receive the delegation of multiple activities generated by the bureaucratic division of labor, and end up acting as Agents of the elected politicians, who here would become Principals, since they end up delegating actions and decisions to them. [18]

Applied to the area of Public Health, Agency Theory has very interesting implications, since the actions commonly used to try to purify the sector (privatization, pseudo-markets, and decentralization) have not had the expected results. There are no perceived improvements in the control of opportunism phenomena, and the increase in effectiveness and efficiency in the protection of citizens' fundamental rights does not improve either. [19] The application of the Agency Theory to the Public Health structures in charge of monitoring and epidemic control of Dengue, can provide a fresh perspective that identifies

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management opportunities hitherto unexplored, in search of building delegation structures where the interests of Principals (citizens) and agents (elected administrators or career bureaucrats) are confluent. Therefore, the consideration of public health phenomena (such as dengue epidemic outbreaks) from their informational perspective is essential.

INFORMATION, AGENCY AND COGNITIVE DISSONANCE

Every social phenomenon is a mixture of facts and assumptions, which make the concept of "truth" very relative. Human beings carry out a permanent activity of creating "myths" (truths self-proven by repetition and generalization) that end up configuring the explanations that the common sense of the collective accepts as truths. [20] *Albert Camus* , in his account of the cholera epidemic in the city of Oran in 1949, portrays this experience as a surreal condition driven by the chaos and pain produced by the disease; a situation in which the logic of the absurd disorients and terrifies the population. [21] Put in informational terms, it can be said that the epidemic situation generates a "collective cognitive dissonance" to, [21-23] that driven by the desire for survival and fear, relaxes the levels of rigor with which information is examined and judged, and facilitates the possibility of flows of innocuous, useless or biased information. This would be anticipated from the " *Zipf* energy principle " [24] and the *Mooers* principle , [25] which establish that following a structure of economy of effort, people tend to select the information that is easiest to integrate into their repertoire of responses, or those offered in easily operable systems, without considering in the first instance the quality and guarantee of fidelity that they offer.

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If we add to this situation the lack of citizen inclusion policies with respect to relevant information on Public Health in states of emergency, and the autocratic exercise of the power to inform by public administrators and medical bodies, any collective possibility of confronting organizedly to epidemic vectors in an efficient and adaptive manner is nullified. The epidemic becomes a scenario that encourages the concealment of the entire range of conflicts, interests and misunderstandings that facilitated its appearance. In this way, Public Health management becomes a multiplier of the agency's phenomena. [26]

Only reliable information empirically related to the progression of the disease can save lives and avoid economic losses. And although there are strong arguments regarding panic and other undesirable social expressions that could be caused by this information, if it is poorly administered, it is also valid to say that not informing citizens eliminates the most valuable resource in the fight against the vector: organized communities. . All to maintain a comfortable position on the part of the authorities. Public administrators have reasons to be concerned about the public's reaction to data on the progress of an epidemic, but this must lead to having specialized policies and units for clear, precise and concise dissemination of information, and eliminating the information embargo that Citizens suffer from situations that put their lives, families and the well-being of their community at risk.

## PUBLIC ADMINISTRATION, INFORMATION AND CITIZEN PARTICIPATION

The monopoly of information on public health by public authorities is based on the consideration of the citizen as a "minor"; unable to take adaptive positions in the

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face of the epidemic threat. Behind this discourse, the risks inherent to the phenomenon of agency in public administration are developed and strengthened. Elected officials and career public servants (the Agents), designated as guardians of the well-being of citizens (the Principals), autocratically manage public health information that could affect their political capital or bureaucratic position. Reporting transparently about the epidemic situation, which implies tacitly or openly accepting the existence of errors and lack of control, ends up not being a viable option for the political and bureaucratic careers of these administrators. The Agency Theory anticipates that there will be a tendency to omit or manipulate any official information that gives indications of lack of control or negligence. The more serious the situation is, the deeper the information asymmetries behind which the government team will entrench itself, to omit, manipulate or delay data as it sees fit.

Given the problems of imperfection and audit costs that affect public management, opportunism will tend to reproduce among Agents, elected and career officials. The information asymmetries resulting from these imperfections will be naturalized by the government discourse, to create an informational regime in which the monopoly is absolute and unquestionable. Only extremely serious crises, such as those caused by the spread of dengue and other vector-borne diseases, manage to destabilize the idea of the "minor citizen" and counterbalance what could be being lost in terms of innovation and improvement of the public health management. It is in the midst of these crises that citizens and citizen control bodies perceive the scope and damage derived from hidden public mismanagement.

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Faced with this situation, the construction of alternative information systems under a self-organized dynamic is the hope of counteracting the Agency phenomenon. This implies setting up redundant information structures, that is, that refer to the same phenomena that official sources refer to, as an alternative version, so that there are different perspectives regarding public health problems and the containment of their risks. threats, some of them managed by the citizens themselves. The greater the redundancy regarding any condition of interest to the population, the greater the possibility of distributing data flows that can provide an exhaustive account of the situation. In this way, citizens would be able to break the information asymmetry established by the government monopoly, while efficiently supporting the audit and control of the administrators responsible for Public Health.

CONTRIBUTING FACTORS OF INFORMATION ASSYMETRIES

The information asymmetries created by the Agency phenomenon are a central factor in the inefficiency of health alert systems, but there are factors that complement this situation and facilitate its persistence. The first of them is the digital divide, which has to do with the multiple levels of limitations that citizens face when they need to access public information online. The digital divide is not only built by the lack of access to computers and the Internet; It also includes the absence of informational competencies to be able to decode the data and use it for the benefit of the community, within a social context that values and stimulates this type of actions, with a view to having citizens trained to make informed decisions and make effective calls to the mobilization. [27-29] Adding the factors included in the

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digital access gap and the second-order digital divide, we have a structure of exclusion layers with the following factors:

- Gaps in access to computers, internet, broadband and software.
- Failures in information literacy (ALFIN for its acronym in Spanish) associated with the absence of information competencies.
- Failures in data literacy, which imply the existence of basic technological and mathematical competencies for the statistical interpretation of data ( *data literacy* in its original English).
- Absence or lack of development of "communities of practice" [30,31] that manage to give value and socially articulate the knowledge related to the previous items.

The second major barrier facing information management in Public Health is that governments do not facilitate the consultation and retrieval of information for the common citizen, nor do they worry about launching technically designed systems based on the capabilities and possibilities of users. The impact of government sites with public information is limited by problems of low predictability in interfaces, slow upload and download speeds, difficulties in viewing information, and the lack of support that guides users on how to find the information. in the labyrinths created in these information services. [32,33] In the end, the citizen's will to be informed about what is happening in their locality in relation to public health is undermined by *Zipf* 's "Principle of Least Effort" : every user in search of information will choose the path of least resistance or "effort." And if the information system does not provide easy paths, the user will adopt unreliable sources or simply give up his effort to be properly informed. [24,25,34]

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The poor political training of citizens is a third factor that undermines the collective capacity for coordination and mobilization to fight for fundamental rights such as health. Information technologies, and specifically social networks on the Internet, end up being good drivers of online debate, but they develop a weak relationship with politically expressive behaviors offline, which are configured more as spaces for social encounter than for democratic construction. . [35,36] This situation - typical of Latin American countries, where the tradition of limiting the direct political participation of the citizen is historical - and the exercise of power, is characterized by being a bureaucratized autocracy, creates a system of mistrust and indifference in the state-citizen relationship, which ends up falling into political messianism. [37-40] All the online construction and discussion ends up fading in the offline world. In this way, the mobilization of effective and permanent efforts for citizen monitoring of transparency and openness of health data, specifically in cases of epidemics, is non-existent.

The fourth factor that limits citizen participation in health management, and that feeds the information asymmetries associated with the agency problem, has to do with the naturalization of the citizen's state of ignorance. The citizen is represented as unimpeachable, unable to understand his actions and their consequences, which makes him unable to do anything useful with Public Health information or make a judgment about what is happening. The tension between expert knowledge, technocracy, and the democratic participation of the citizen is resolved by disregarding the latter. [41] It is clear that in countries such as Latin America, where the quality of education is low and exclusive instructional systems predominate, citizens will have difficulties in dealing with complex issues such as public

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health. But the answer cannot be to exclude the community from information flows, and legitimize itself in the technical-magical discourse that submerges medical information in an aura of mystery, built on unintelligible jargon. This is an old strategy of domination described by *Foucault* , in which what is communicable is placed beyond the reach of the layman to make it prey to the power of the words of the authorities, and to exercise *biopowers* over the population without limitation. These *biopowers* refer to the administration of the citizen's body legitimized by technical discourse, with the power to manage people's routines, their life and their death. [42-44]

Being in possession of medical knowledge ends up confused with the ability to understand the connotations of the social facts of health. The existence of total secrecy in public health data is legitimized, and at the time of an epidemic, this justification is reinforced with the declaration of "A Matter of Public Order and National Security." This technocratic discourse conveniently validates the centralization and monopoly of data in the hands of bureaucrats and elected officials, who are the very architects of the crisis. *A doxa* is created , that is, an absolute, dogmatic discursive system, in which the autocratic and totalitarian behavior of public administrators ends up legitimized and appearing "normal", accepted, and even defended by those who are dominated. [Four. Five]

## CONCLUSIONS

The Agency problem is a phenomenon that arises from the differences of interests that coexist in the interstices of the socioeconomic structure of the global Information Society, characterized by distant property relations, the super-

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specialized division of labor, and the delegation of multiple daily tasks. The rationalist perspective of Classical Administration and Bureaucratic Theory thought of management systems as free of elements of social dissonance, and idealized organizations under the concept of a machine: a set of synchronized gears fully aligned in their objectives.

However, Agency Theory and research in Behavioral Economics demonstrate that every organization and society is an ecosystem of conflictive relationships between power groups and different interests. The structure of division of labor and "remote administration", imposed by the globalized economy, facilitate the multiplication and strengthening of information asymmetries at all levels, following the differences of interests and groups already noted. In the Information Society, the systems and data flows circulating in organizations and societies are manipulated; monopolized so that the information asymmetries that characterize them are perpetuated and naturalized, along with the absence of control over the moral and technical risk that this implies. This phenomenon exists in public administration and affects the administration of health information.

The recent case of an undeclared dengue epidemic in 2014 in Marília, Brazil, is an example of the inefficiency of public administration, hidden for years behind a doxa of information asymmetries constructed and naturalized by public power, which was formed by launching advertising *slogans* that informed nothing about the real state of the disease and its vectors. This administration model, which manages information with its back to the public, is a failed public health model. The Agency Theory foresees that, in the absence of alternative information mechanisms, self-managed by citizens, that in a technically supported way

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counterbalance the state narrative and can bypass *the* blockages instituted in the flow of data, it will be impossible carry out effective monitoring and control of government officials. Ineptitude in monitoring and controlling the phenomena that anticipate the epidemic outbreak will never be charged. Once the epidemic arrives, the public administration, safeguarding its interests, will use all its power to hide or minimize data that demonstrates its responsibility in what could have been anticipated or controlled. Citizens, in the current state of misinformation and absence of data, within an exclusive relationship and not committed to action, are reduced to a passive flock incapable of contributing to the health surveillance and control system, and incapable of demanding relevant actions from public administration.

This vicious circle can be minimized using information technology, if it is applied with a perspective of self-organization and Community Informatics. Self-organization involves training and empowering citizens and non-governmental organizations to deal with transparent and freely accessible data b. [46] Community Informatics means stimulating the spontaneous organization of communities so that they appropriate computer tools on their own terms, and thus can provide additional and alternative information, useful for the community itself. Mobile technology, through APPs, is a promise for this type of venture.

There are information collection APPs that, with citizen collaboration, capture data on the occurrence of events such as crimes or traffic accidents, geolocate the occurrences, and classify them. In this way, with simple data and through cross-referencing of information, very complete overviews of the general situation in a sector of the city or in a community are achieved. Based on the concept of

information as a viral phenomenon, these systems base their reliability on the large number of reports received, which statistically compensates for the natural biases that occur when the reporting subject is not trained or cannot be supervised. The management of self-reporting of social phenomena from the citizens themselves immersed in the problem to be reported can also generate additional benefits: the creation of citizen networks, social awareness, and the emergence of self-instruction or shared learning dynamics. The possibilities are endless and offer the alternative of rethinking epidemiological monitoring and control systems from new perspectives. Here the Theory of Agency applied to health management has been presented, and the consideration of epidemic events in their dimension of flows, asymmetries and informational structures, as an initial step for this revolution.

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**Conflict of interests**

The author declares that there is no conflict of interest.

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# Managing Information and Epidemiology: Analyzing Spatial Distribution of Dog Bites

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**ABSTRACT**

Information management is important for health institutions. Therefore, the objective of this research was to identify the information products obtained from a georeferenced information system, using as an example the spatial distribution of people bitten by dogs in the city of Temuco, to show useful products for decision making. The information products associated with their geographic component made it possible to visualize environmental elements that classic products such as reports make it difficult to represent. Using a georeferenced information system and satellite images, we were able to indicate that there are two areas with a high concentration of people bitten by dogs: Pedro De Valdivia and Pueblo Nuevo, with 36.8 and 1.4% respectively. We were also able to evaluate particular events of interest in relation to fixed sources of information and determine the environmental components involved. Finally, using data based on a georeferenced information system, multiple information products were generated that would be dependent on the required information needs. Georeferenced information systems are very helpful tools in responding to the increasingly demanding needs for immediate, economical and simple information products. The products obtained through the georeferenced information system allow epidemiologists to consolidate and

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integrate information, know the distribution and density, as well as perform analyzes according to the needs that events of pathological interest require and that are summarized in monitoring. , control and its possible eradication.

**Keywords:** Information management; georeferenced information system; epidemiology; bites.

## INTRODUCTION

From a health point of view, it would take up hundreds of pages to record all the health information we need, and many more to reasonedly justify why we want it. This information must be reliable, timely, versatile and must be integrated; [1] must be available in a practical and simple way for decision making, and that is why it is considered a resource as important as financial and human resources. [2] Information management (IG) or information management ( *information management* ) has gained an important space in institutions whose mission is the development of information services and products. [3] In health services, GI refers to obtaining the right information, for the right person, at the right price, at the right time and in the right place, to make the right decision. [4]

The Royal Academy of the Spanish Language defines information as the "acquisition of knowledge that allows one to expand or specify what one possesses, on a specific subject"; and management as "carrying out an initiative or project" or "managing or leading a situation." [5] In this way, GI emerges as a concept within the field of information science, oriented to the management of the corporate intelligence of an organization, which allows internal structuring and reacting to changes in its environment. [4]

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Health information management is defined as a mechanism for the collection, processing, analysis and transmission of information that is required for the organization and operation of health services and also for research and teaching. [6,7] Information management is used in epidemiology, understood as the study of the distribution and determinants of states or events (diseases) related to health and the application of these studies to the control of diseases and other health problems. [8]

In the information management process, it is necessary to know the information needs, the acquisition or sources of information, its organization and storage, the development of products and services, their use and distribution, which is also the basis for the creation of the knowledge during productive existence. [2]

There are several models that allow us to understand GI, such as those described by *Páez Urdaneta.* [9] *Choo* [10] and *Ponjuán* . [11] But the 7 Rs model, proposed by *Butcher* and *Rowley* , [12] is more practical to understand. Its components are: recovery, reading, recognition, reinterpretation, validation, emission and restructuring. *Ponjuán* [3] briefly and simply describes this model, to which we will provide relevant examples for a better understanding.

Epidemiological information is generated, for example, when a patient goes to a healthcare center and through the recording of data and history in different documents such as: the clinical record, the mandatory notification forms for illnesses, injuries, expense control, among others; It becomes the sources from which we will obtain subsequent information (recovery or retrieval).

These documents will be read to obtain cognitively relevant conceptual knowledge (injuries, infection, symptom, among others) that we will call information

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( *reading* ), surrounded by variable circumstances that make it subjective (recognition *)* and that is why medicine It is not an exact science, since health is determined by multiple factors intrinsic and extrinsic to the affected person. Conceptual knowledge with its associated subjectivity becomes information that must be delivered in an understandable way; for example: a report of bitten people with graphs, statistics or indicators (reinterpretation or *reinterpretation* ).

When we have valuable information (report of people bitten) we need to know if the information contained is above or below what we should understand as normal. For this we usually compare our information with the proposed goals or regional, national or international indicators (validation or *reviewing* ). Validated information needs to be transmitted in a practical and understandable manner to all levels of the health system (including the population) through reports, leaflets, radio or television messages, as occurs in prevention campaigns for hantavirus, dengue, yellow fever or Chagas (emission or *release* ).

With the information validated and disseminated, organizations must generate adaptation measures [2] to improve the quality of the information and generate services or products that protect the population beyond prevention (restructuring *)* . Among the first we find the use of new technologies that allow improving collection, processing and reducing the under-reporting gap. Among the latter, intervention measures such as vaccination and health education (aimed at the target audience), among others.

With the use of new technologies, information is beginning to be considered as a reserve of knowledge without limitations in its use and increasingly accessible to

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everyone. [4] In this sense, the use of tools such as georeferenced information systems (GIS or GIS, in English) have been used since the time of *John Snow* [13] to help describe the spatial distribution of a disease or event of interest.

GIS are powerful tools for the manipulation and analysis of large volumes of data (statistical, spatial and temporal) necessary to generate, in a flexible, versatile and integrated way, information products (maps or reports) and for decision making. . [14,15] To demonstrate the geographic component present in 80% of the world's corporate data, georeferencing can be used, defined as the positioning of the location of a spatial object in a given coordinate and *datum* system . [16] *Datum* is a topographic term that encompasses the fundamental point and reference ellipsoid factors, which determine the position and direction of an object in a mathematical approximation to the Earth's figure. [17]

GIS in health are used to study the association between environment and disease, such as: the association between childhood cancer cases and the influence of high voltage towers, [18] as well as cases of cholangiocarcinoma associated with geographic areas, [19] which simplify large tasks. They allow determining the health situation in an area, identifying high-risk groups, planning and programming activities, monitoring and evaluating interventions, such as in health emergencies resulting from natural disasters (earthquakes, floods, among others). and epidemic outbreaks (avian influenza, Ebola, dengue, chagas, rabies, to name a few). Furthermore, it allows us to determine patterns or differences in the health situation in the face of particular aggregation perspectives, ranging from the continental, regional, national, departmental or district level to the local level. [twenty]

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One of the most important zoonoses worldwide is rabies due to its high lethality. It is necessary to maintain close epidemiological surveillance on the cases of animals and humans positive for the disease and the injuries suffered by people as a result of dog bites because it is a means of viral transmission; These should be considered a bioindicator of risk of acquiring the rabies virus. In Chile, rabies is the most important zoonotic disease due to its high fatality rate; because it is endemic, limited to bats and their wild cycle, and the dog is the natural transmitter to man. This risk situation increases when we find ourselves in an environment where people have lost the perception of the risk of acquiring diseases through dogs [21] and maintain risk behaviors such as: sleeping with pets, kissing them, allowing themselves to be licked, not washing their hands. (after playing, petting or feeding), sharing narrow and common environments such as armchairs, cushions, among others.

Generally, the health information systems implemented allow us to quickly obtain percentage, prevalence or incidence rates that are required and with this to monitor or measure the magnitude of an event of interest. But it is valid to question what is the added value of the information we have or the products we generate; What other information can we obtain and whether information products are helpful for decision making.

Understanding that economic and human resources in health systems are always scarce, it is possible that a GIS, as part of the health information management instruments, can help answer these questions. Therefore, the objective of this research was to identify the information products generated by a georeferenced

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information system, using as an example the case of people bitten by dogs in the city of Temuco.

## THE PRODUCTS OF INFORMATION MANAGEMENT

Information management with data obtained from different sources generates information products commonly in the form of written reports with tables and graphs with their respective comparison parameters (proposed goal), to evaluate the situation as positive or negative, favorable or unfavorable and have a cut-off point between one decision and another.

The data shown in the table , in addition to being a way of organizing and summarizing the information, stratifies it by geographic component. In this case, it is not possible to visualize how the data is distributed in said area, much less identify risk factors or associate them with an environmental component. That is why information products, such as maps or epidemiological cartographies, reach their maximum value through the analysis of images (reinterpretation phase).

**Board.** Prevalent rate in 144 people bitten by dogs, according to sector of the city of Temuco in 2010

Source: Data from the primary health care network.

If we incorporate the same data with its geographical component (XY coordinates in Transverse Mercator Units) in a GIS we can generate an epidemiological cartography as an information product and observe a trend of attacks that we can describe as a concentric distribution in the areas of Pedro de Valdivia and in the

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union between the areas of Costanera and Pueblo Nuevo, random in the Poniente, Amanecer and Centro areas, and which is weak towards the periphery of the city ( Fig. 1 ). The primary care network (yellow crosses) has been added for illustrative purposes.

The information extracted by the observer is an individual perception and, therefore, susceptible to interpretation bias; [22] Therefore, it is recommended that the images be analyzed by more than one observer, in order to reduce bias (validation phase).

GIS allows us to carry out a new phase of reinterpretation and validation using data management tools to determine areas of greater occurrence of an event of interest or greater density. These use known quantities of some phenomena (XY points) and expand them in a defined geographical area; That is, it divides a geographic area, counts the points of interest present and then compares these areas with each other to generate density images. By agglomerating points and differentiating into strata by color (we recommend four strata: baseline, low, medium and high risk), we can generate a qualitative form of frequency expression for decision making ( Fig. 2 ).

## SATELLITE IMAGES USING TECHNOLOGICAL TOOLS

In general terms, cases of people bitten by dogs occur with a low level of frequency in the city, but two areas of high frequency are identified (at least 23 cases): a small one on the border between the Costanera del Cautín and Pueblo Nuevo, and the second in the Pedro de Valdivia area. In the latter there is a

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Primary Health Care Center in an area with a medium frequency of cases (15 to 23 people bitten), represented in a black circle, in which it is necessary to determine why there are people injured by dog bites in the area. place; What are the elements that allow this situation to be generated and what are the elements that allow it to be perpetuated. To answer these questions, the management team could send a human team to analyze the situation on the ground, which would imply costs in human resources and associated logistics.

The use of complementary technological tools, such as Google Earth ©, allows us to obtain free satellite images in which we can identify and evaluate events of interest with reference to fixed sources of information such as: houses, buildings, green areas, landfills and others ( that do not change in years) and reduce costs in human and logistical resources. It must be taken into consideration that there are differences in distance or length measurements between objects. The narrower or more detailed the measurements are over a geographic area (centimeters or a few meters), the greater the measurement error could be. [23] Likewise, the real coordinates of an object of interest *versus* those reported by the platform are usually offset by several meters. Finally, an expert in-person evaluation in the field will always have better results ( Fig. 3 ).

Using images, the primary care center (number 2) and the risky urban environmental components would be located: a narrow street, with parked vehicles and street or illegal commerce, and decreased space for free pedestrian traffic. In the lower corner (number 1) is an enclosure that stores and distributes chickens to supermarkets; At the end of the street, a Kindergarten (number 3) and a School (number 4) whose garbage containers have a high amount of food (provided to

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children in snacks given by the state) available for the dogs that feed and thus persist. in the zone. This, added to the lack of dog removal as a control measure, predisposes the location to dog bite attacks.

From the epidemiological point of view, the removal of stray dogs from the area, the prohibition of informal commerce and the parking of vehicles on the street while the health center is in operation, the increase in the frequency of waste removal solid school and kindergarten or the assignment of a special schedule, in such a way that the availability of food for the dogs is minimal, are basic measures to control environmental factors and that without a GIS would not have a decision-making support. .

*Butcher* and *Rowley* [12] explain that not all components of the GI model may be present in a system. Some may be developed simultaneously and others will follow a more limited cycle as happens with GIS. Through the recognition, reinterpretation, validation and issuance phases, different, independent or related products are generated, such as distribution cartography, risk stratification densities from the same baseline data, which depends on the need for information required. .

All the information presented was obtained by incorporating the geographic component or place where the attack occurred into the georeferenced information system to generate the information products (epidemiological cartography).

Regarding the limitations of this work, we must indicate that the information presented is illustrative and not an in-depth scientific analysis of the city's bite cases; Only the most practical uses of information products are rescued.

## CONCLUSIONS

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This information system allows, on a continuous basis, to incorporate and process a large amount of data, to generate information crossing between different periods and pathologies, and most importantly, to generate new and constant information products, as may be required by the operator. situation enhanced with the use of tools such as Google Earth © and MapCity ©, among others, which are available for free and help optimize economic and human resources in obtaining information.

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**Systematic mapping of the use of information and communication technologies in type 2 diabetes**

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# Managing Information and Epidemiology: Analyzing Spatial Distribution of Dog Bites

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**ABSTRACT**

Non-communicable diseases have increased in recent years and have caused great morbidity and mortality. Among them, type 2 diabetes mellitus has become an epidemic that is associated with one of the main causes of death worldwide. Its management is mainly preventive, since it is associated with inadequate habits and styles, among which eating habits and a sedentary lifestyle stand out. This work aimed to identify the characteristics and results of the use of multimedia technology for the management of type 2 diabetes mellitus in the different investigations reported by the scientific literature for the prevention, control and management of the disease. The EBSCO, SCIENCE DIRECT, LILACS and SCOPUS databases were consulted, and a total of 156 potentially useful articles were found, but when applying the typing criteria a total of 13 was reached. Multimedia technology shows usefulness for preventive management and the control of diabetes, and in general of non-communicable diseases; however, the articles are not precise in determining the effectiveness of the multimedia used. Text messages and videos show a greater tendency of use in the different interventions.

**Keywords:** Multimedia; type 2 diabetes; education; prevention and control; technology; systematic mapping.

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## INTRODUCTION

Non-communicable diseases, according to the World Health Organization (WHO), "are long-lasting diseases that generally progress slowly" that make it difficult for the general population to receive timely attention. There is a long list of diseases classified in this group; Among them are heart diseases, cancer, respiratory diseases, diabetes and obesity, [1] which cause 4.3 million deaths annually in the Americas, of which 1.63 million deaths are caused by cardiovascular conditions. . [2]

Non-communicable diseases are also called behavioral diseases, since they present risk factors associated with habits and lifestyles such as tobacco and alcohol consumption, inadequate eating and nutritional habits, and a sedentary lifestyle, which are known as behavioral factors. modifiable risk. [3] In this regard, in Latin America it is reported that more than 59% of the population is overweight or obese, and it is the second region with the highest alcohol consumption, where 19% of people smoke and have low levels of physical activity. . [2]

One of the chronic diseases that has gained strength and has become an epidemic is type 2 diabetes mellitus (T2DM). This is the most common disease (90%) among the different types of diabetes. DM2 is caused by inadequate production of insulin and the inability to respond to this hormone, which generates hyperglycemia. [4] The data on this situation are alarming. In Colombia, 1 in every 14 adults has diabetes, with an average treatment cost per person of $805 and 15,373 deaths have been identified due to this disease. [5]

Management for DM2 is varied and is focused on the prevention and control of risk factors, mainly on changing the patient's lifestyle. If the course of the disease

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continues, pharmacological and surgical management are other measures adopted for treatment. [4] In this regard, there are various studies that report the use of different policies, strategies, programs and experiences whose objective is to promote the adoption of healthy habits and lifestyles, for which they use tools such as information and communication technologies (ICT). ) through different types of tools such as mobile applications, web, social networks, wearable devices and multimedia content such as videos, audios and/or text messages, among others. [6-8]

The general use of information and communication technologies (ICT) has increased abruptly and progressively. The report from the National Statistical Administrative Department (DANE) found that in Colombia, in 2016, "58.1% used the internet anywhere and from any device; of this percentage, 70.4% did so through cell phone (...); of the national total of people aged 5 and over who used the Internet, 75.4% did so to access social networks (...); 36.9% of the national total of households had a fixed internet connection and 21.8% had a mobile internet connection. [9]

Likewise, the purpose of using ICT varies depending on the area of application; for example: entertainment, education, health, among others, and has required the development of cognitive and motor skills to understand and manipulate this type of tools, with subsequent implications in health, culture, ways of relating and in general in the quality of life of society. [10-14]

The use of ICT has been increasing in recent years and a variety of technological developments have been seen in the area of health that promote people's well-being. There are reports of studies where these technologies have been implemented in health programs with purposes that range from preventive and

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even reach intervention; However, the effectiveness of the latter has not been determined conclusively, so it is necessary to identify the characteristics and results of the use of multimedia technologies for the management of type 2 diabetes mellitus in the different investigations reported by the scientific literature. for the prevention, control and management of the disease.

## METHODS

To achieve the proposed objective, the present study used the systematic mapping methodology, which is a useful method to build classifications and obtain information about the existing knowledge on a specific topic; Therefore, it allows the identification of gaps and needs in a given area, thereby approaching the definition of a relevant research niche. Analysis of the results is done by categorizing the findings and counting the frequency of publications within each category to determine the coverage of the different areas of a specific research topic. [15] The mapping was carried out following the stages proposed by *Peterson* and others, [16] who defined five stages:

1. Define research questions.
2. Carry out the literary search.
3. Select studies.
4. Classify items.

5. Extract and perform data aggregation.

The research team posed two macro questions to resolve with the mapping:

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1. What are the characteristics of the use of ICT (media, channels, delivery, intervention and follow-up time, number and characteristics of participants, frequency of messages and effectiveness) as a tool for the prevention and treatment of T2DM?

2. What are the publication characteristics around the topic (years, authors, country, type of documents)?

The literary consultation was carried out in the EBSCO, SCIENCE DIRECT, LILACS and SCOPUS databases. The keywords and search string were: diabetes type 2 OR diabetes mellitus type2 OR diabetes AND multimedia. The terms used were consulted in the LILACS DeCs. The registration number was found for multimedia 33195 and for diabetes Mellitus 3942 and the unique identifier D019212 and D003920 respectively.

The search was limited to articles from academic publications that showed full text between the years 2012 to 2017 and contained the keywords mentioned above. In the first search, a total of 156 potentially useful articles were found, but when applying the typing criteria (inclusion and exclusion) established by the research team, 13 finally met them. The classification criteria were: peer-reviewed publications, journals, full text and containing the thesaurus terms mentioned above. The information was initially recorded in Excel and later transferred to PSPP and R wizard (Free Software) to perform the descriptive analysis.

**RESULTS**

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The total number of articles analyzed was 13 that met the inclusion criteria and did not present exclusion criteria. The search was carried out between the months of December 2016 and August 2017. The database that returned the most articles was SCIENCE DIRECT with five articles, where 2015 was the year with the highest number of publications with four articles; The country with the highest number of disclosures was the United States with four articles, followed by Iran with three ( table 1 ).

The methodology used in the research was mostly controlled and randomized clinical trials; Six articles were found and the most used medium was mobile applications with a frequency of four studies ( table 2 and 3 ).

Regarding the characteristics of the intervention through the use of ICT, it was found that two trends predominated in its intention, one for educational and feedback purposes *and* another for academic purposes of literary review and mapping (four articles respectively) ( table 4 ).

The tracking time range mentioned in the articles is between 0 and 2 months; The number of participants predominated in those who worked with more than 100 participants and the type of multimedia was videos and mobile phone messages with special use of text messages ( Fig. ).

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The majority of results indicate that the use of multimedia is useful for the management of chronic diseases and especially type 2 diabetes mellitus. This usefulness refers to the education of patients in terms of greater knowledge about the pathology, prevention and their care, especially the management of dietary aspects and physical activity; however, most studies do not show sufficient evidence or support to generate scientific evidence on clinical changes after the use of these technological tools.

## DISCUSSION

The increase in the use of communication and information technologies has generated changes in the habits and lifestyles of the population in general, which have permeated the economic, political, social and cultural dynamics of the country and the world, and to the case of this document, health interventions.

In the health area, the use of these technologies has two possible paths, one that predisposes to the disease [17] and the other, on the contrary, as a support tool in different health processes. The path of the disease in this aspect is related to the inappropriate and excessive use of ICT, which leads to a decrease in physical activity levels, and even inactivity; the increase in sedentary lifestyle with a subsequent and alarming rate of obesity at a global, national and local level, as well as the increase in the prevalence of inflammatory diseases caused by overuse and inadequate postures, eye strain and the development of cell phone dependency. [17,18]

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In this regard, there are some studies, especially in school populations, that denote this concern in relation to learning processes, since excessive use can generate "mental disorders such as addiction, dependence, impulsiveness or compulsion, dispersion of attention, forgetfulness and difficulty in assimilating knowledge." [19]

In young adult populations, reports show the association with especially inflammatory diseases related to the postures adopted when using screens and computer equipment for prolonged periods of time (4-5 hours), [20,21] as well as the presence of pain in different parts of the body, eye stress, lower back pain and pain in the wrists and fingers; [22] However, reports of illness or alterations in adults are made especially in work contexts and there are few studies that are not within this framework.

In contrast to this trend and in accordance with the findings of this study, there are various investigations that report the use of technologies as an aid for various treatments, and especially to support educational and self-care processes; [23,25] however, their levels of evidence are low. In this sense, it is important that future studies include the measurement of physiological variables such as glucose levels and lipid profile to more objectively identify the effectiveness of the interventions carried out.

Likewise, these studies must consider, from the point of view of technology selection, its design and its quality based on aspects related to context-aware devices and software, user-centered design and usability respectively. to facilitate acceptance and adherence to these prevention and treatment alternatives, and their results. [6]

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Consistent with what was found in the present study, it is possible that videos and mobile phone messages, with special use of text messages as the most used media reported by the different authors, are the most accepted due to the characteristics of the study populations, which were mostly carried out in the United States of America. [26-28] However, it is important to highlight that due to the Colombian context, these technologies may not be the most appropriate and especially in rural contexts where access to the Internet is difficult.

As important data, the indicators of the National Administrative Department of Statistics of Colombia reported that in 2016, 58.1% of people used the internet, and of them, 70.4% connected via cell phone, 45. 8% of households had an internet connection and 74.7% over 5 years of age used it, [9] which denotes a high activity around this type of ICT, with greater use when accessing social networks with 75.4%. .

The above apparently leaves a large population with coverage and the possibility of generating alternatives focused on promoting health promotion and disease prevention processes; However, digital divide studies in Colombia show that the indicators established for its measurement, where infrastructure, services, applications and users were analyzed, have a better rating in "departments with large capitals, densely populated areas and/or or close to the development poles". [29]

Based on these data, the analysis of this document allows us to affirm that if the work focuses on rural populations, interventions supported by ICT are required that do not necessarily require internet connectivity, such as those used through television, since that according to the DANE census in question, 93% of the total population had a color television, [9] and on the other hand, if it comes to working

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with urban populations or in populated centers, it is possible to work with the support of Internet. However, most studies state that the evidence is not sufficient for glycemic control. [30]

Another important consideration is that related to age, since these are populations with diabetes, they are generally at ages corresponding to the older adult or elderly group, and from this perspective, this population uses technologies more through videos. and text messages on mobile phones that —according to Patricia *M. Valles Ortiz , Félix Miranda , S. García Sosa, S. Ella , M. Saffari , G. Ghanizadeh* and *HG Koenig*— "appear to be effective in glycemic control," [30,31] while in young populations, with whom it would possibly focus To work on the prevention of chronic diseases such as type 2 diabetes, one could think about working on information technologies through social networks.

Similar to what was found in the present work, *Greenwood* and others report that the main actions on which the different technological developments focused were around healthy eating, physical activity and metabolic control as self-care behaviors, and on the other hand, the actions focused on the intervention that showed a significant decrease in A1c, for which they were supported by communication, health data generated by the patient, education and feedback, [32] aspects that in themselves are covered in an educational process .

## CONCLUSIONS

Despite finding limitations in the findings and results on the modalities used through information and communications technology in type 2 diabetes, due to the lack of sufficient and standardized information reported by the studies, the

different investigations around the topic of The use of ICT in health primarily shows its use as a control and treatment tool when the disease has already developed. Text messaging and videos are those that show the highest frequency of use in the different interventions. However, the findings of this study do not allow us to identify with certainty the effectiveness of the use of ICT tools for the prevention and treatment of T2DM.

It is important that to determine the effectiveness of the use of ICT in the treatment of T2DM, the editors require that the authors identify the characteristics of the technologies used, especially what is related to the channel, the type of multimedia and its frequency of use, since that the findings of this review do not guide decision-making in this regard. Likewise, it is important that editors require researchers to be clearer about the variables to be involved.

To establish the effectiveness of these tools in DM2, specifically what is related to treatment adherence, it is important to consider the characteristics of the population and especially the access to ICT and the academic level of the participants, as well as their interest.

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# The Connection Between Reading And The Health And Well-Being Of Individuals

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## ABSTRACT

The objective of this study was to identify the elements of reading that most powerfully involve us in this activity and its relationship with health. For this, a survey was designed and distributed among people who usually read, belonging to the autonomous communities of Castilla y León, Extremadura, Madrid and Asturias. In this, respondents had to value those aspects that they considered most important to them regarding reading: tranquility, fun, information and others. After 255 responses were collected and analyzed, the results highlighted that above the traditional functions related to training and information activities, what respondents value most are the protective aspects of reading, such as alleviating loneliness, avoiding negative thoughts and managing better emotions.

**Keywords:** Bibliotherapy; reading; health; Spain; readers.

## INTRODUCTION

Reading is an activity that enriches our lives and opens the doors to information and knowledge, although we also read for entertainment: good stories also help to make the imagination fly and are an escape valve in certain situations (depression, stress ). When we read, we are not only improving our working memory. It is proven that reading makes us feel better and more positive. Furthermore, it can

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show us our own life reflected in that of another person. Our empathy with others extends through reading, as do our imagination and understanding.

The use of reading to provide quality to life was known in ancient Thebes (Egypt) where the papyrus book was valued for this purpose. Already in the 18th and 19th centuries, reading was widespread in psychiatric hospitals in England, France, Germany and Scotland, where it was prescribed to admitted patients as part of therapy.

However, the origins of bibliotherapy as such are located in the United States around the 1930s. After the Second World War it was applied to the care of soldiers who had a lot of time during their convalescence; They experienced that reading provided them with calm and improvement and with that purpose therapeutic reading groups began to be implemented, which were later generalized to other countries and other centers (reception centers and asylums).

*Carolina Shrodes* 's thesis , in the USA, became a reference on which numerous subsequent therapeutic reading programs have been based. [1] In it she defined bibliotherapy as an active, dynamic process between the reader's personality and a fictional text, in which emotions are mobilized and used for conscious use in the individual's change. This is one of the lines of development of reading: its value as treatment or therapy. It is born in the theoretical framework of behavioral psychology, but then uses deeper internal relationships (psychoanalytic) by understanding that reading enhances the representations of the psychic apparatus; It shapes it, makes it stronger and, sometimes, healthier.

*Clarice Forkamp Caldin* , from the Federal University of Sta. Catarina, Brazil, [2] describes in an article her experience in the development of reading as a

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therapeutic possibility. In it, using reading, story telling, dramatizations, music and dance, a process of personal and, in many cases, therapeutic enrichment is achieved. Reading thus fulfills a therapeutic function that promotes catharsis, humor, identification, introjection or projection of therapeutic elements that contribute to improving the person's life, and are shown as an effective instrument in combating tensions. of daily life. Bibliotherapy can show effectiveness at the intellectual, psychosocial, interpersonal, emotional and behavioral levels. [3]

For *Buela-Casal* y *Caballo* , bibliotherapy is "the use of written materials (in some cases self-help material) to help patients modify their behavior, thoughts or feelings." [4] It has also been defined by *Russell* and *Shrodes* as "a process of dynamic interaction between the reader's personality and literature—an interaction that can be used for personality assessment, adjustment, and growth." [1] In Spain , *Luis Aparicio Sanz* did an excellent bibliographic review on the subject, regarding bibliotherapy and its applications. [5]

In relation to Health, but applied to libraries, in 2014 the *Arts Council England* commissioned the "Simetrica" agency to carry out a study on the assessment of the benefits that public libraries provide for Health and well-being. The objectives of the study analyzed the associated value of library use with improved well-being. Among the results obtained, the value of library services was taken into account, and how this differed depending on the type of service and the sociodemographic characteristics of the person. Factors driving people's perceptions regarding service use were also taken into account. The other part of the study analyzed how libraries could contribute to improving society through their effects on Health. He referred to the positive impacts for society as a whole,

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which at some point may be an indirect benefit for the individual. The importance of this study is that it is the first to be done on the health and well-being benefits of public libraries. [6]

Beyond Health goals, but related to it, a recent study by Yale researchers showed a significant link between book reading and longevity. The researchers analyzed data from 3,635 individuals over the age of 50 who had been involved in a US Health study for several years. The study suggests that reading books, rather than the press or magazines, provides a survival advantage among the elderly (HR= 0.80, $p < 0.0001$). And compared to non-book readers, 80% of book readers gained a 23-month survival advantage. According to one of the authors, *Becca Levy* , professor of Epidemiology and Psychology at Yale, "reading books involves two cognitive processes that could confer a survival advantage: the slow, deep immersion necessary to connect with the content; and the promotion of empathy , social perception and emotional intelligence"; For this reason, the lifespan of book readers is two years longer than that of non-readers, which is months. [7]

Basically bibliotherapy is the application of reading as an experience that contributes to the healing and well-being of people, since literary sources can positively help in the resolution of complex problems that applies to general medicine. Today, health workers and institutions recognize the wide and varied use of bibliotherapy in a wide range of settings. However, not all reading is therapeutic, although other important values are attributed to it. Some studies have defined the requirements for it to be so, such as an adequate selection of the material that will allow the patient to see himself reflected in it as in a mirror, and will allow him to find solutions to his problems "from outside himself." The

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therapist must have the ability to extract information that is relevant to the patient's specific problem at that moment, to motivate him in reading, and will be able to extract what is relevant in that process. And finally, he must help in the reflection on the material worked on without putting into it more than what the patient has managed to identify.

For some authors [8] the material for reading must be brief, but complete, not excessively technical, easy and enjoyable to read. Others have emphasized that the help provided by reading does not work for all patients and, therefore, is not generalizable; It would only work for some of them and they must meet a series of minimum requirements, such as knowing how to read fluently, having a taste for reading and sufficient reading skills to avoid additional effort to the discomfort they already have. [4] This way of understanding reading has helped in the treatment of different types of problems. In cases of anxiety and depression, in the treatment of sexual and relationship problems of complicated grief, [9] body dysmorphophobic disorder, [10] in eating disorders, [11] obsessive-compulsive disorder, overweight and morbid obesity [8] ADHD. [12]

At the present time there is no sufficiently proven evidence on the effectiveness of bibliotherapy when it comes to problems where the need for immediate gratification is important. And it has also not been shown to be useful in the treatment of anorexia, impulse control, and alcoholism problems. In cases of serious clinical problems it has not been studied, given that the majority of the articles analyzed refer to mild and moderate conditions.

For *Sharon Morgan* [13] and *Víctor Frank* [14] , bibliotherapy does not focus only on the use of books to treat problems, but can also have a preventive component to

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prevent relational or emotional difficulties from appearing **.** There is the possibility of using books as something preventive beyond the strictly pathological. This is the other branch of reading that interests us: that of reading as prevention.

In the 90s, when the clinical conception of Health/disease was added to a conception of personal development as a basis for Health, the WHO defined this not only as the absence of disease, but as everything that results in a good quality of life, including bio-psycho-social and relational components. From here on, "it is no longer necessary to be sick to find relief in a book, since reading nourishes thought and emotional life, generating psychic resources that support emotionally distressing situations." Some studies along these lines are those carried out on healthy lifestyle habits [15] and on the prevention and treatment of Bournout . [16] This path of analysis of the reading element as a means to enhance resilience is what guides our interest.

For *Grotberg,* resilience is the ability of a human being to face the adversities of life, overcome them and even to be transformed by them. It is activated when we are presented with a problem that needs to be faced and overcome; It is then necessary to prepare for adversity, survival and learn from this experience. [17] The components of resilience are considered to be: Conscious self-esteem, introspection, independence, the ability to relate, initiative, humor, creativity, morality and critical thinking. These factors would protect human beings from adversity and allow them to overcome it and improve themselves. The working hypothesis of this applied research is that non-compulsory reading enhances the resilience of people who read regularly.

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Books give us many things, and if we ask different people, we will get very different answers regarding what enriches each one: for some, knowledge; for others, it allows them pleasant leisure; and in other cases, it allows them to live other lives and develop their imagination. It also facilitates projective identification with different themes and characters and this makes it possible to relativize one's own. Taking into account some of these studies, this work aimed to identify the elements of reading that most powerfully involve us in this activity and its impact on health.

## METHODS

To achieve the stated objective, a cross-sectional study was carried out that allows us to know the reasons why people read and the value and benefits that citizens give to reading. As a measuring instrument, a questionnaire developed for this study was used, which is composed of 10 items, which reflect the possible theoretical advantages of pleasurable reading and which include the following concepts: tranquility, fun, information, neutralization of negative thoughts, development of imagination, management of negative and positive emotions, challenge, activation of cognitive functions such as attention and concentration, and neutralization of the feeling of loneliness.

The survey collected demographic information of the people surveyed such as: age, sex, educational level, country of origin and membership or not of a reading club, and was carried out in a self-administered manner. The 10 phrases that should be evaluated were the following and in this order:

1. Reading helps me stay calm.

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2. It amuses me.

3. It helps me inform myself.

4. It makes me not think about other things (negative thoughts).

5. It offers me an open window to the imagination.

6. It helps me see how others manage their emotions (jealousy, fear, guilt, joy).

7. It gives me satisfaction because each book is a challenge.

8. It allows me to have topics of conversation with other people.

9. It keeps me alert, awake or focused.

10. It provides me with company.

This questionnaire was completed anonymously by a randomly selected sample whose only inclusion criterion was "being a regular reader." Each reader values, with an academic scale, from 1 to 10, the importance of each of the Items that are part of the survey, in which the number 10 is "the most valued or the most important for the reader" and the number 1 is what I would put in "last place" or the least valued).

The scope of the study is limited to the general Spanish population of any age and sex, as long as they meet the inclusion criterion, namely: being regular readers and giving their consent to participate in the study. The respondents belonged to the Autonomous Communities of Castilla y León, Extremadura, Madrid and Asturias. A random sample of 225 readers was obtained. The SPSS 23.0 program was used to analyze the data and the information obtained in a descriptive and quantitative manner.

## RESULTS AND DISCUSSION

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The sample was made up of a group of 225 readers. Of them, 51.5% were women and 48.5% were men. By age groups we found that the majority were between 51 and 60 years old (31%), although there was also a significant mass of readers who were between 41 and 50 years old (23.1%). The rest were distributed in the group < 30 years and 61-70 years (13.3% in both cases). This percentage decreased in the group > 71 years old (8%) and the rest would be between 31-40 years old (10.6%). Most of the sample had university education (47.1%); 32.4% high school studies; 15.1% primary or secondary studies and 5.3% vocational training. Practically half of the sample belonged to a reading club (51.5%) compared to 48.4% who were not members ( table 1 ).

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**Tabla 1.** Distribución de la muestra

| Edad (años) | Frecuencias | Porcentajes (%) |
|---|---|---|
| < 30 | 30 | 13,3 |
| 31-40 | 24 | 10,6 |
| 41-50 | 52 | 23,1 |
| 51-60 | 70 | 31 |
| 61-70 | 31 | 13,7 |
| >71 | 18 | 8 |
| Sexo | | |
| Mujeres | 116 | 51,5 |
| Hombres | 109 | 48,5 |
| Nivel de estudios | | |
| Primarios/secundarios | 34 | 15,1 |
| Bachiller | 73 | 32,4 |
| F.P. | 12 | 5,3 |
| Universitarios | 106 | 47,1 |
| Club de lectura | | |
| Sí | 116 | 51,5 |
| No | 109 | 48,4 |
| Totales | 225 | 100 |

Table 2 shows the average of the scores assigned by readers to each element. Thus, it is observed that what respondents value most about reading is its ability to accompany them, or provide them with "company" (6.7), followed by its value to avoid negative thoughts (6.6) and manage their positive or negative emotions. (6.1 ).

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**Tabla 2.** Valoraciones medias por ítems

| Ítems | Media |
|---|---|
| Tranquilidad | 5,9 |
| Diversión | 4,2 |
| Información | 4,6 |
| Neutralización del pensamiento negativo | 6,6 |
| Imaginación | 4,4 |
| Gestión de emociones | 6,1 |
| Reto | 4,8 |
| Tema de conversación | 5,9 |
| Mantener funciones cognitivas | 5,6 |
| Paliar sentimiento de soledad | 6,7 |

In this line of assessment, the next most valued component is the ability of reading to give the reader peace of mind (5.9) and, what is more interesting, "a topic of conversation with other people" (5.9). Its value in maintaining or enhancing cognitive functions such as memory, attention and concentration is recognized (5,6), and the functions that have traditionally been seen as essential values of reading remain in a second level of importance for the readers of this study: get informed (4.6), develop your imagination (4.4) or have fun (4.2). It is understood from the observations of this study that our readers give an intermediate value to the challenge that starting and finishing each book would entail (4.8).

To respond to the main objective of this study, through a survey, we assessed some of the aspects that were traditionally considered associated with reading, such as formative and informative values and other types of sentences with values closer to the benefits that Reading affects health, both in preventive and curative aspects. The question was to determine what values prevailed in their responses.

- Phrases of a formative and/or informative nature.

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- Phrases of a recreational and/or evasive nature.
- Phrases of a preventive nature.
- Phrases of a healing nature.

Consequently, in a generic way, it can be said that the phrases that had to be valued fundamentally belonged to two large groups: on the one hand, the formative and/or informative values that have traditionally been associated with reading; and on the other hand, the values related to well-being. Of course, the respondents were not aware of this classification, which was intended to make them evaluate the phrases as objectively as possible, without stopping to think that they were of one type or another ( table ).

**Cuadro.** Tipos de preguntas por su carácter preventivo o formativo

| Tipos de frases |
|---|
| Formativo/informativo |
| 3. Leer me sirve para informarme |
| 5. Leer me ofrece una ventana a la imaginación |
| 8. Leer me permite temas de conversación |
| Preventivo/evasivo/curativo |
| 1. Leer me sirve para estar tranquilo |
| 2. Leer me divierte |
| 4. Leer hace que no piense en otras cosas |
| 6. Leer me ayuda a ver cómo otros gestionan sus emociones |
| 7. Leer me produce satisfacción |
| 9. Leer me mantiene alerta y concentrado |
| 10. Leer me proporciona compañía |

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Some of the statements shown could be framed in different groups at the same time - for example: "reading gives me topics for conversation" or "reading gives me company" - which we have classified in the preventive reading group, but which could also form part of the curative/preventive values, due to the relationship between the capacity for socialization and Health as a value that contributes to feeling better and that, therefore, could also have preventive/curative values.

As can be seen from the results, the element that readers consider most valued is that reading provides company and serves to reduce loneliness. The existential loneliness of daily life currently enhanced by an increasingly individualistic lifestyle forces the individual to seek particular tools and solutions to alleviate it, and many people seek refuge in reading as a way of relating to real "others" ( other readers) or fictitious (characters).

The second element valued is the avoidance of negative thoughts, followed by the ability to see how others manage their negative emotions and learn from this. *Albert Ellis* [18] and *AAron Beck* [19] explain in their conceptualization of stress that negative thoughts are precedents or triggers of the sustained physiological activation that gives rise to stress. For these authors, emotional reactions are the result of the way in which reality is interpreted and structured (if someone is anxious it is because they interpret reality negatively, perceiving it as dangerous or threatening).

Each painful emotion would be caused by a particular negative thought and chronic emotional pain. Emotional discomfort would be generated by a systematic bias in that person's worldview; The anxious person would tend to see any incident as threatening, and these alarm or combat responses would be what they call

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anxiety (which gives rise to general malaise, stomach ulcer, etc.). The events, therefore, would not have an emotional content in themselves, but it would be the interpretation of that event that would cause us discomfort.

For these authors, anxiety and depression are the result of focusing attention on a group of these automatic thoughts (the negative ones), while excluding all the opposite ones (the positive ones). If the readers of this study mostly consider that reading helps them avoid paying attention to these negative thoughts and, in addition, that they learn from others (fictitious) when managing these negative emotions, it can be said that reading, as stated in This study can become a prevention mechanism against stress and loneliness, key factors in the generation of anxiety and depression as health problems of high incidence and prevalence in the population.

Regarding the next most valued factor, it would be the contribution of "tranquility" to the reader, the element traditionally highly valued by Primary Education teachers throughout history, who have been able to see how the children in the classrooms of this age could not only learn new knowledge through reading, but also use it (e.g. stories) as a procedure to achieve the tranquility that is required in the classroom for teaching and learning, and that makes us question whether the resolution of the task of learning through new Information and Communication Technologies (ICTs) such as tablets, computers, etc. may be neutralizing an important means of obtaining peace of mind in the classroom, since these technical means are, on the one hand, faster in solving school problems (rapid search for information, less depth in the content) and, on the other, they can be configuring a style of functioning of the child with less tolerance for non-quick responses, for

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solutions that are not easy or immediate. In short, it makes us ask ourselves the question of whether reading books can help "make" children calmer and less lonely, since reading also provides conversation topics that make it easier or possible for us to relate to others. Or, on the other hand, if it is the "quiet" children who benefit the most from reading and who consequently would most tend to include reading in their repertoire of healthy habits. Both hypotheses leave new lines of research open for the future.

Becoming informed, developing the imagination or providing fun are other elements of reading that have been widely studied in child development. Pedagogically, many efforts have been made to implement reading in children, not only as a tool for later learning, but also because it enables the development of imagination and is a permanent source of fun. This is also highly valued by the age group of our study, which supports the hypothesis of the cultivation and permanent development of functions such as imagination in adulthood and the legitimate desire for “fun” as another component of mental health. This is understood not only from the absence of illness but from the perspective of the "ability to enjoy" as an indicator of mental health. The readers of this study give an intermediate value to the challenge of starting and finishing each book; Therefore, it is possible that taking reading as a challenge may have to do with the personality of the reader in particular, rather than with the effect of reading itself.

Finally, it can be stated that in middle-aged adults the "active maintenance of cognitive functions" (attention, memory, concentration) and the interest in "being informed" about what surrounds us are once again important, which means In

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short, another component associated with good relational health. Personal isolation, withdrawal into oneself and social isolation are risk factors in a good number of mental problems and illnesses; So getting out of yourself, taking an interest in others and interpersonal relationships, as well as the world around us, can be valued as an indicator of a healthy state of the individual and, in some way, preventive of problems such as anxiety or depression. , and perhaps to some extent it can prevent diseases such as neurodegenerative diseases or dementia where these functions are soon affected and should be the subject of future studies and research.

CONCLUSIONS

The study that has been developed allows us to approach an idea of reading not only as a source of training and information, but also as it can provide the individual with other values necessary for their Health and Well-being. The observed results allow us to consider that the readers' motivations go beyond the above, since in the majority of cases the people who answer the survey identify gratifying values for Health, such as the management of health, as priority motivations for reading. emotions, alleviate negative feelings and mitigate loneliness, which could have a preventive and healthy nature.

The need to continue researching in this field is anticipated based on this and other works, accepting the limitations that this may have due to its own idiosyncrasy, being a study with a small number of readers and with a certain geographical demarcation.

**Conflict of interests**

The authors declare that they have no conflicts of interest in carrying out the study.

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