Evaluation of the Implementation of the National Policy on Science, Technology and Innovation in Health in Brazil

Avaliação da implantação da Política Nacional de Ciência, Tecnologia e Inovação em Saúde no Brasil

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ABSTRACT With the aim of analyzing the implementation, in Brazil, of some components of the National Policy on Science, Technology and Innovation in Health, in the period between 2004 and 2010, a case study was carried out within the scope of the Department of Science and Technology. In addition to the strategies, the following components were analyzed: the selection of priorities, the formulations of calls for proposals, the monitoring and the evaluation of the policy. It was implemented in relation to most of the strategies proposed, particularly, with regard to the induction, expansion and decentralization of the fostering. It is discussed the historical conditions of possibility besides the problems, obstacles and limits of the policy, as well as the actuality of this historical case, that can be considered as exemplary.

KEYWORDS Evaluation. National Science, Technology and Innovation Policy. Public policy.

RESUMO *Com o objetivo de analisar a implantação, no Brasil, de alguns componentes da Política Nacional de Ciência, Tecnologia e Inovação em Saúde, no período compreendido entre 2004 e 2010, foi realizado um estudo de caso no âmbito do Departamento de Ciência e Tecnologia. Além das estratégias, os seguintes componentes foram analisados: a seleção de prioridades, a formulação dos editais, o acompanhamento e a avaliação da política. Esta encontrava-se implantada em relação à maioria das estratégias propostas, particularmente, no que diz respeito à indução, ampliação e descentralização do fomento. Discutem-se as condições históricas de possibilidade além dos problemas, obstáculos e limites da política, bem como a atualidade deste caso histórico, que pode ser considerado exemplar.*

PALAVRAS-CHAVE *Avaliação. Política Nacional de Ciência, Tecnologia e Inovação. Política pública.*

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Introduction

The complex social construction process that resulted in the formulation of the National Policy on Science, Technology and Innovation in Health (PNCTIS) was only started in 1994, with the holding of the I National Conference on Science and Technology in Health (CNCTS), whose resolutions, however, were not implemented. With the creation of the Department of Science and Technology (Decit), in 2000, and the Secretariat of Science, Technology and Innovation (SCTI), in 2003, it was possible to hold a II CNCTS, in which the National Agenda for Health Research Priorities (ANPPS) and PNCTIS guidelines were approved.

The policy, thus formulated, had as its general objective to induce and finance relevant health research, not only for attending to the 'health needs of the population', but also to produce new knowledge. To achieve these objectives, it contained principles, conducting axis, strategies and actions (BRASIL, 2008B). Among these objectives, the induction and decentralized promotion of research were prioritized (BRASIL, 2010A).

Several essays and investigations have analyzed, since then, the PNCTIS, mainly in terms of its formulation and the main strategies for implementing the policy in its early years (ANDRADE; CARVALHO, 2014; GUIMARÃES *ET AL.*, 2006), in addition to analyzing the results of some national thematic calls for proposals, such as those in the biotechnology in health area (ALMEIDA-ANDRADE, 2015), the promotion of studies in the field of cell therapy and stem cells, in Brazil (BRASIL, 2010A), and some degree of institutionalization of the evaluation of health technologies and its incorporation into the Unified Health System (SUS) (SILVA; PETRAMALE *ET AL.*, 2012). These works reveal positive impacts of the PNCTIS on stimulating and financing research, in strategic areas of the Country, particularly regarding the fact that all the sub-agendas that made up the ANPPS, approved in 2004, received some funding, in the period between 2003 and 2005 (SILVA, CAETANO, 2011).

The overall evaluation of the PNCTIS, however, had not been made systematically until 2009. In december of that year, Decit asked the Oswaldo Cruz Foundation (Fiocruz) to carry out an external evaluation of its policy (NATAL; HARTZ; SANTOS, 2010), which would seek to answer the following questions: 'To what extent were the agenda priorities included in the calls for proposals and the projects selected therein?'; 'To what extent have the resources allocated been sufficient for the development of the proposed investigations?'; 'To what extent was the management of the development process adequate?'; 'To what extent do the results of the investigations answered to the problems proposed?' Regarding the first of these questions, Barata (2008) observed that the selection of the majority of the projects financed (90%) was done by Public Calls for Proposals, in cooperation with the National Council for Scientific and Technological Development (CNPq), Funding Authority for Studies and Projects (Finep) or the State Foundations for Research Support (FAPs), covering all sub-agendas.

This paper presents the results of the subproject that analyzed the implementation of some components of PNCTIS between 2004 and 2010.

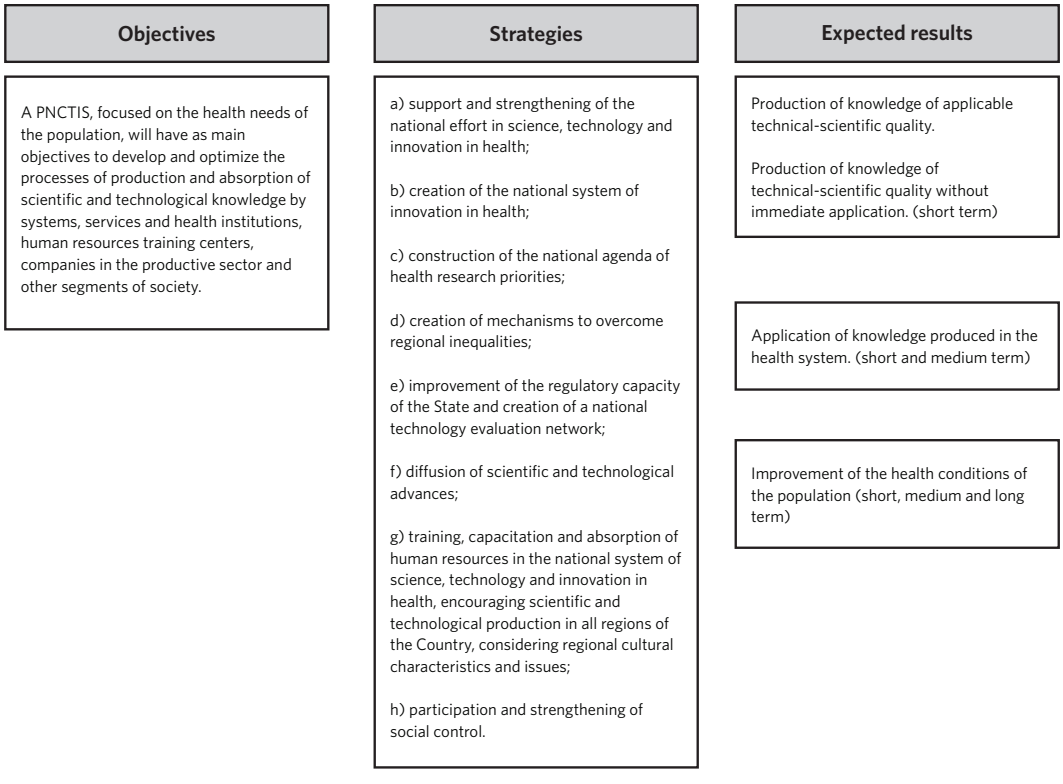
Methodology

An analysis of the implementation of the PNCTIS was carried out, in the period between 2004 and 2010, through a case study. The components selected for the evaluation were: a) The eight strategies contained in the policy document (BRASIL, 2008B); b) The actions related to the management of the promotion, namely: the selection of priorities, the formulation of calls for proposals, the monitoring and evaluation of the policy. The evaluation of the implantation was

considered as the judgment about the adequate operationalization of the intervention, having as parameters the policy documents, as well as the goals framework drawn based on the theoretical references of the study.

Initially, an evaluation was undertaken of the degree of implementation of the eight strategies proposed in the base document, 'National Policy on Science, Technology and Innovation in Health' (BRASIL, 2008B). The 11 actions related to the strategy "Sustaining and strengthening of the national effort in science, technology and innovation in health" (BRASIL, 2008B, P. 21) were, also, evaluated. For this purpose, a preliminary logical model was elaborated (*figure 1)*, which corresponded to a macro model derived from the objectives, strategies and expected results (BRASIL, 2008B). It was considered as implemented, the component of the PNCTIS for which there was complete information on the execution of the action in documents. In other words, documentary information was considered sufficient as evidence of implantation. For those strategies or actions in which information was incomplete or insufficient, the assigned classification was 'partially' implemented. The information was considered insufficient when it could not be considered as conclusive evidence of implantation.

Figure 1. Logical model of the National Policy on Science, Technology and Innovation in Health (PNCTIS)

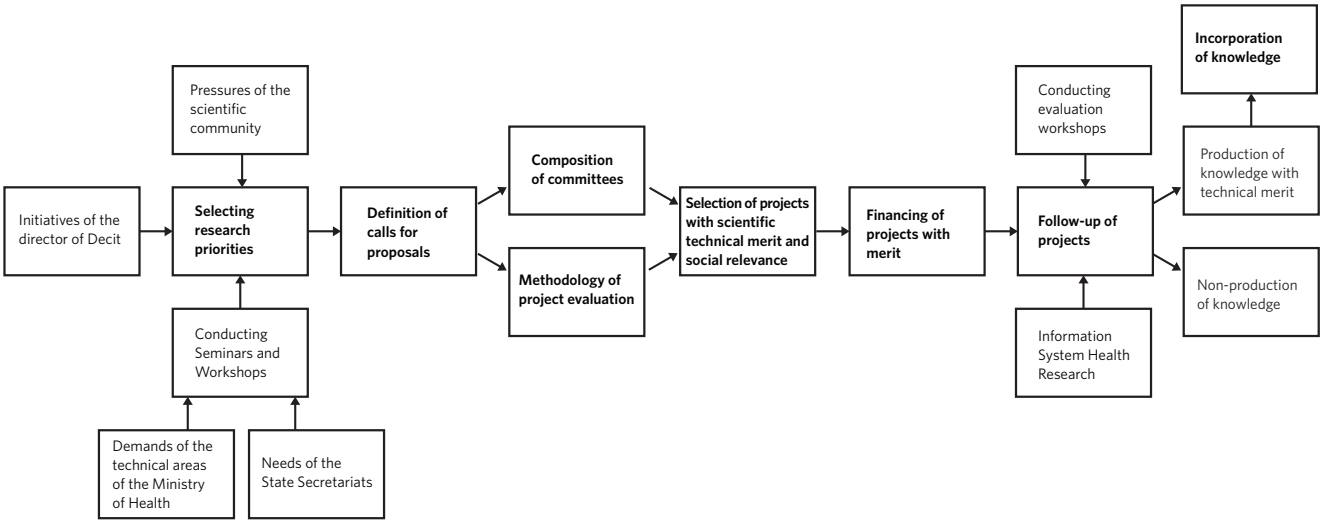


Source: Own elaboration.

The data were obtained by analyzing the following documentary and bibliographic sources: management reports of the Decit, from 2004 to 2008 (BRASIL, 2005, 2007A, 2007B, 2008A, 2009); National Calls for Proposals; reports from the Science and Technology Conferences; ten-year evaluation report of the Decit (BRASIL, 2010B); and the Lattes curricula of the members of the judging committees. Technical notes produced by the department were also consulted (BRASIL, 2006A, 2006B, 2010C, 2010A), as well as the project sites and the networks of researchers created because of the implementation of the policy.

Then, the analysis of implementation of the fomentation management was carried out, in the scope of Decit. The analysis of implantation, besides the measurement of its adequate operationalization, tries to relate it to the context of the implantation. With this aim, a second logical model was developed (*figure 2*). This model corresponded to a goal framework of the actions considered necessary and pertinent for the achievement of the purposes related to the induction, selection and judgment of the calls for proposals, research financing and the use of results. There was a preference for the analysis of the management process related to the selection of priorities, the formulation of the calls for proposals, the monitoring and evaluation of the policy.

Figure 2. Logical model induction, judgment and follow-up of the products of the National Policy on Science, Technology and Innovation in Health (PNCTIS) within the scope of Decit (MH)



Source: Own elaboration.

It was considered the 'context' of the implantation as the historical conditions of possibility of the implantation of the policy. This analysis was made to identify historical events related to the genesis of policy, which not only created the structural conditions for its formulation and operationalization, but also influenced the conceptions and practices of the agents involved. These, in turn, structured and socially constructed these conditions.

Eleven in-depth interviews were conducted, in 2010, with the Secretary of Science and Technology of the Ministry of

Health (MH), directors, sub-coordinators (substitute coordinators) and professionals working in the various sectors of the Decit, identified through the snow ball technique. Two interviews were, also, conducted with former managers, and obtained information by e-mail from a third party, which totaled 14 interviews. The script that guided the questions was personalized for each coordinator/technician. Informed Consent Forms were signed by the interviewees. Although all of them agreed to be identified, it was chosen to maintain the anonymity of the respondents, who will be identified as E1...E14. The informations were complemented with the analysis of the documentary and bibliographic sources already mentioned.

The interviews provided information about the implementation process, social, professional and political trajectories of respondents and conceptions about science and technology, as well as the view of the managers on obstacles to implementation. The professional trajectories, analyzed through the academic training and the positions held in the university and in health institutions, allowed to classify the predominant insertion of the interviewees in the scientific and/or bureaucratic fields. Data collection was done in September and October 2010.

Results and discussion

The implementation situation and the funding management

The PNCTIS was found implemented with reasonable consistency, during the period investigated (2004 to 2010), with respect to most of its objectives, particularly those related to induction, expansion, decentralization and the search for reduction of regional inequalities in the research funding *(chart 1)*.

Considering the breadth of the policy objectives, for the elaboration of the implantation matrix the strategies and several proposed actions were considered, through which appear, implicitly, more specific objectives (BRASIL, 2008A). The analysis of this chart reveals that, for most of the proposed strategies and actions, documentary records were found indicative of their complete or partial operationalization *(chart 1)*.

Chart 1. Strategies, objectives and actions of the National Science, Technology and Innovation Policy, according to the implementation situation (2004-2010)

Strategies	Implantation			Evidences
	Yes	Partial	No	
a) support and strengthening of the national effort in Science, Technology and Innovation (CTI) in health;		X		
a.1) articulation with the bodies responsible for the training of new researchers and support for scientific initiation at all levels of education, as well as at the permanent health education centers, respecting regional needs and creating channels of participation for new researchers;		X		Term of Cooperation and Technical Assistance between the Ministry of Health and the Ministry of Education. Official Journal of the Union - Section 3, of May 30, 2008; Term of Cooperation signed on April 14, 2009, which established the Post-Doctoral Program in Human Health (Post-Doc SUS); produced publications to support the training of members of Research Ethics Committees, on ethical and methodological analysis of research protocols (BRASIL, 2006A).
a.2) creation of incentive awards for scientific and technological development in health;	X			The Science and Technology Incentive Prize for SUS was launched in 2002.

Chart 1. (cont.)

a.3) creation, expansion, diversification and guarantee of continuity of sources of funding for Research and Development (R&D) actions in health;		X	Term of Cooperation and Technical Assistance between MH and MST, from 2004; in 2005, partners CNPq, Finep and Unesco invested R$ 127.8 million; in 2006, CNPq and Finep invested R $ 125 million (DECIT, 2006b); calls for proposals in partnership with CNPq, with R$ 18 million and 148 approved projects **(BRASIL, 2011; DECIT, 2006A)**
a.4) development of the capacity for management and implementation of STI actions in the three political and administrative spheres of SUS;	X		Creation of the Research for SUS Program (PPSUS) – Beginning in 2001, reaching all Brazilian states in 2004. With the following partnerships: CNPq, FAPs, SSH and Secretariats of Science and Technology.
a.5) strengthening of partnerships among public institutions for the promotion of health research;	X		Since 2005, Decit has been funding calls for proposals in Health Technology Assessment (HTA), in partnership with CNPq **(BRASIL, 2011; DECIT, 2006A)**; partnership with the FAPs, SSH and State Secretariats of Science and Technology **(BRASIL, 2006B)**
a.6) incentive to create or support the nuclei of science, technology and innovation in health in the departments of health, linked to higher education institutions and research institutions;		X	Reference to the installation of cores in several SSH **(BRASIL, 2010),** however, few sites located, such as the SSH nucleus of Santa Catarina (http://200.19.222.8:8080/outplan/); implantation of Virtual Health Libraries (VHL): 71 VHL stations; 27/SSH; 16/MGS; 6 partnership/BVS-Psychology; 7/SUS hospitals; and 4/SUS technical schools **(BRASIL, 2010).**
a.7) encourage the creation of municipal and state science, technology and innovation councils;		X	No evidence was obtained in the documents analyzed.
a.8) stimulating the participation of health sector workers in scientific and technological research;		X	No evidence was obtained in the documents analyzed.
a.9) Continued investment in the improvement of technological R&D infrastructure in health, with special attention to the teaching hospitals/net of the SUS, research institutes, federal centers of technological education, health councils, Higher Education Institutes (HEI) and health services of public nature;	X		Creation of the National Network of Clinical Research (RNPC) (Public call MST/MH Finep - Transversal Action - implantation of clinical research units - 04/2005); creation of thematic networks for the research of problems prioritized in the ANPPS: Brazilian Network of Health Technology Assessment (Rebrats), Multicentric Network for Orthopedic Implant Evaluation (Remato), Northeast Network of Biotechnology (Renorbio).
a.10) efforts to create partnerships and research networks in countries of Latin American, Africa and Asia, with a view to common health problems;		X	No evidence was obtained in the documents analyzed.
a.11) promotion and realization of CNCTIS every four years;			The 1st and 2nd National Conference on Science, Technology and Innovation in Health (CNCTIS) were held.
b) creation of the national system of innovation in health;		X	a) Creation of Sectoral Funds in Health and Biotechnology (Finep); b) opening credit lines; c) regulation of the FNDCT; d) Program of National Self-sufficiency in Immunobiological (Pasni); http://bvsms.saude.gov.br/bvs/is_digital/is_0204/pdfs/IS24(2)049.pdf.
c) construction of the national agenda of health research priorities;	X		National Agenda for Health Research Priorities (ANPPS) approved at CNCTIS II.
d) creation of mechanisms to overcome regional inequalities;	X		Contemplated by the actions of the PPSUS **(BRASIL, 2006B, 2008).**
e) improvement of the regulatory capacity of the State and creation of a national technology evaluation network;	X		Council of Science, Technology and Innovation in Health/MH (CCTI) **(BRASIL, 2003)**; Coordination of Technology Assessment in Health and Health Technology Management Seminar (2005); Commission for the Incorporation of Health Technologies (Citec) **(BRASIL, 2006C);** Formation of the Brazilian Network for Health Technology Assessment (Rebrats) **(DECIT, 2006A).**
f) diffusion of scientific and technological advances;		X	Presence in the Decit of a Knowledge Management Coordination, however, this activity was not structured; Implantation of Virtual Libraries in Health (BVS Public Health); Creation of the SISC & T, which manages the Research Program for SUS, the Science and Technology Incentive Award for SUS (http://portal2.saude.gov.br//sisct/login.cf).

Chart 1. (cont.)

g) training, capacitation and absorption of Human Resources (HR) in the national system of science, technology and innovation in health, encouraging scientific and technological production in all regions of the Country, considering regional cultural characteristics and issues;	X	Consolidation of scientific production and qualification of human resources, characterized by the formation of 668 new masters and 332 PhDs, graduate students whose research was completed with the support received from projects funded by PPSUS **(BRASIL, 2010B).**
h) participation and strengthening of social control.	X	The approval of PNCTIS counted on the participation of organized segments of society in the CNCTIS.

Source: Own elaboration.

The main component implemented was the induction of funding, guided by the ANPPS, through various strategies of approximation between the scientific community and the governmental managers of health institutions. The priority given by the MH to PNCTIS was expressed both in its progressive institutionalization, materialized by the creation of the Secretariat of Science and Technology, in 2003, as well as in the volume of budgetary resources allocated to the sector, which rose from R$ 23.177.321,00, in 2003, to R$ 125.209.209,00 in 2004, reaching R$ 387.345.796,00, in 2010, obtaining, therefore, an increase of 1.571%, in the analyzed period (SILVA; CAETANO, 2011).

On the other hand, there was an increase of the research funding for several states, through the Research for SUS Program (PPSUS). Even the creation of several thematic networks, such as the Brazilian Network for Health Technology Assessment (Rebrats), the Multicentric Network for the Evaluation of Orthopedic Implants (Remato), the National Clinical Research Network (RNPC) and the Northeast Network for Biotechnology (Renorbio), were initiatives with potential to contribute to the development of research in the various regions of the Country. This decentralization of financial resources, however, did not mean the expected reduction of the regional inequalities predicted, as shown by Danda, Queiroz and Hoffmann (2016). According to these authors, transfers of federal resources to the FAPs in the period between 2004 and 2012, were higher in the states that had the highest Human Development Index (HDI) and higher concentration of doctors (DANDA; QUEIROZ; HOFFMANN, 2016). These results reinforce the thesis that research funding cannot be dissociated from investments in the training of researchers.

To evaluate the projects to be financed, besides the evaluation of scientific merit, usually by *ad hoc* consultants, the criterion of social and economic merit or applicability was incorporated. However, what would be the social and economic merit was not very clear in the speech of the interviewees. It appeared as evident, common sense. Also in the analysis of the reports of the Judging Committees of the Calls for Proposals was not made explicit how the social relevance had been incorporated.

The information system, denominated Health Research (SILVA; CAETANO, 2011), created to monitor the projects approved in the various calls for proposals, had many gaps, including low percentages of completion of some variables. In addition to this initiative, there were several ways of incorporating both the scientific community and the MH technical areas in the evaluation, such as seminars and workshops (E8).

Despite the existence of these tools, the process of monitoring the projects was not systematic and not even the end products were not easily accessible. The available informations were produced, mostly, by means of academic studies of technicians of the department (ELIAS; SOUSA, 2006).

Relations with CNPq/Finep/FAPs

The establishment of partnerships between Decit and the government's research funding agencies, at their various levels, not only resulted in a greater contribution of resources but also in the qualification of funding management. The partnership with the Ministry of Science, Technology and Innovation (MCTI) took place through a technical cooperation agreement with the MH. Decit made budget transfers to MCTI, which allocated them to CNPq and Finep to finance combined calls for proposals. In 2005, the partners CNPq, Finep and the United Nations Educational, Scientific and Cultural Organization (Unesco) invested R$ 127.8 million, and in 2006 CNPq and Finep invested R$ 125 million (BRASIL, 2006B), amounts higher than the budget of the Decit for those years, which was of the order of R$ 66 million, in 2005, and of 73 million, in 2006 (BRASIL, 2010B).

The CNPq was considered important for the management of the research selection process because it is an institution with the expertise and adequate infrastructure for this activity. There was, however, another point of view, according to which the ideal situation would be the autonomy of the Decit in relation to funding, which would imply the creation of it's own agency for research funding, so that they would not be dependent on the bureaucratic structure of the MH (E6).

On the other hand, from the point of view of the interviewees of CNPq, the partnership with the Decit was mentioned as very important for the institution, not only with regard to the definition of priorities, but, also, in the scientific dissemination that the Decit did through its portal (E12).

The partnership developed between Decit and the FAPs would also have resulted in an increase in the resources allocated to research at the local level, resulting in the strengthening of the National Science and Technology System throughout the Country, and reducting regional inequalities in the research funding, from the perspective of the interviewees (E4, E12).

From the point of view of the managers interviewed, the obstacles to the implementation of the policy were related to the precariousness of the employment relationship of the majority of Decit's technical staff and the absence of a personnel policy (E4, E6). As in other departments of the MH, the board consisted of professionals with technical training and competence, but with temporary contracts, leading to high staff turnover (E2, E4, E5, E12). Few professionals were tenured, and most of the group was selected through public calls (E10). The absence of a stable bureaucracy caused the discontinuity of processes and affected the accumulation of technical capacity, during the studied period.

The implementation of most of the objectives of the PNCTIS, verified in the period (2004 to 2010), is consistent with other studies that investigated the same theme (ALMEIDA-ANDRADE, 2015; GUIMARÃES *ET AL.*, 2006; NATAL; HARTZ; SANTOS, 2010; SILVA; PETRAMALE; ELIAS; 2012; TENÓRIO; MELLO; VIANA, 2017). In addition, the aforementioned policy has broadened support for the infrastructure of health research in clinical research and the constitution of several thematic networks, through the calls for proposals (TENÓRIO; MELLO; VIANA, 2017). The priority given by the MH to PNCTIS was expressed in its progressive institutionalization, as well as in the volume of budgetary resources allocated to the sector.

The definition of an ANPPS, in the II CNCTS, fulfilled the role of enabling the meeting and the dialogue between researchers and managers, which was adopted in later events. These spaces created, along with the technical cooperation agreements signed with the MCTI (CNPq and Finep), brought to the MH some elements of the logic of the scientific field, through peer judgement, based mainly on merit. On the other hand,

the CNPq began to participate in the definition of calls for proposals along with managers and technicians of health institutions – MH and State Health Secretariat (SHS). Because of this fact, its advisory committees sought to incorporate 'social relevance' and regional equity in the criteria of judgment, thus, approaching the world of work.

Despite the importance of the ANPPS, the selection of priorities was concretely influenced by several orders, from personal and/or collective initiatives of Decit's directors and technical staff to the result of the pressure of researchers and the technical areas of the MH.

These results are the product of a process of social construction that began at the time of the democratic transition, when the I National Conference on Science and Technology was held, in 1985, convened by Minister Renato Archer to subsidize the actions of the newly created MCTI (BRASIL, 2002B). On the other hand, its development in concrete actions, especially about the expansion and induction of funding, only consolidated later, with the advent of the legislation that created the sectoral funds, as well as the horizontal fund destined to the infrastructure for the research, in 1999 (PACHECO, 2007). This legislation also dictated induction, emphasis on technological production and decentralization. The creation of Decit, in 2000, still as Department of the Secretariat of Health Policies, was influenced by this process. However, it was only in 2003, with the creation of the SCTI, that the volume of the own resources of the Decit increased considerably and the implementation of the policy was expanded.

Among the main obstacles identified by the Decit team were the small institutionalization of the department itself, in which most technicians had temporary contracts, which generated discontinuity, loss of institutional memory and instability. Consequently, the organization of work processes varied widely, with reports of overload, centralization and lack of document archiving routines.

Although the amount of resources earmarked for health research increased considerably, during the period analyzed, the identified needs demanded even greater expansion, considering, in several published notices, references to projects approved on merit, but not financed due to lack of resources.

Regarding monitoring and evaluation, although there were several initiatives for this purpose, the identification of the main results of the funded research was difficult, given that the network sites created and the 'Health Survey' were not up to date.

The limitations of this evaluation are related, foremost, to its scope due to the necessary delimitation of the analysis of the implantation to the component funding management. The other components of the process, which complement the research funding, explained in the second logical model *(figure 2)*, include: selection and judgment of projects with merit, their execution, production of relevant knowledge, until the incorporation of this knowledge in the practice of health services. All of these moments require additional specific research, in various scopes. Secondly, the incipience of the 'Health Research' system, as well as the difficulty of obtaining the set of documents and information necessary for the analysis.

Conclusions

The findings of the present evaluation provided evidences on the implementation of most of the objectives of PNCTIS, in the period between 2004 and 2010. The conditions of possibility that influenced this result were related to several articulated phenomena, such as the diversity of the trajectories of Decit leaders and the influence of CNCTS. They also made possible the coexistence between support for basic research, and the induction of funding in line with health

policy priorities. On the other hand, the process of redemocratization of the Country started the incorporation of the scientific community to the debate on the issue. But the creation of sectoral funds, with the contribution of a greater volume of resources for research, together with the increase in Decit's own budget, created the material conditions for funding.

At that historic moment, the creation of Decit and SCTI in the MH allowed the formulation and institutionalization of PNCTIS. The occupation of the leading positions of these instances by managers with mixed trajectory, both in the scientific field and in the bureaucratic field, with insertion in the sanitary movement, institutionalized not only the consultation to the researchers, through the elaboration of the ANPPS, as they decentralized and reduced the inequalities, through PPSUS. In this way, the funding management of the PNCTIS can be characterized as successful and innovative, because it achieved to articulate the induction of funding, aiming at the improvement of the SUS, with structural support to consolidated research groups. Despite these results, their improvement and expansion require the increase of the volume of resources destined to the financing of the research in health, mainly directed to the strategic and long-term projects.

Finish writing this article occurred at a time of fiscal adjustment and budget cuts in 2016, which could impact on the overall financing of science, technology and innovation in the Country. The analysis of the historical period here, however, remains actual as an exemplary case of the historical possibilities of formulating and implementing a PNCTIS capable of influencing national development.

Contributors

Ligia Maria Vieira-da-Silva conceived the design of the research, participated in the collection and analysis of data and writing of the manuscript. Monique de Azevedo Esperidião contributed to the conception of the design of the research, participated in the collection and analysis of data and writing of the manuscript. Gerluce Alves Pontes da Silva contributed with the conception of the design of the research, participated in the collection and analysis of data and writing of the manuscript. ■

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