FISAL Project

Public Funding of Health Research.
A Latin American Comparison

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Table of contents

Introduction and Acknowledgements

Health research was defined by the 43rd World Health Assembly[1] as "a process for systematically obtaining knowledge and technologies which can be used to improve the health of individuals and groups. Such research work provides basic information on the population's health and diseases, on how to develop prevention, healing and alleviation of the effects of diseases, and helps to better plan approaches to individual and community health services".

Despite the essential function of research to meet new and old public health challenges, it has been noted that funds allocated to these purposes are not necessarily linked to the needs of the population in developing countries that bear the greatest burden of disease. In 1990, the Commission on Health Research for Development established the so-called "10/90 gap" (Global Forum, 1999). According to this initiative, out of the US$ 30 billion invested globally in health-related Research and Development (R&D) in 1986, less than 10% was allocated to studying 90% of the health problems in developing and underdeveloped countries.

In 1998, this diagnosis on the imbalance between needs and resources led to the creation of the Global Forum for Health Research, with the purpose of contributing to the analysis and adjustment of the gap. The guiding principle of the Global Forum has been to focus efforts on research in the health problems faced by the poorest individuals and communities, improving resource allocation. This will only be feasible by facilitating collaboration among the different players of the health sector (public, private, non-profit organizations, etc.), based on priorities which shall lead to achieving more equitable and efficient health systems.

Latin America is not alien to the need for analyzing and designing mechanisms targeted to reducing the imbalance between health research investment and the population's health needs. Its measurement, however, is still pending. The region must provide good quality health services to face a dual epidemiological profile (communicable and non communicable diseases), for which it has limited resources. At the same time, it must promote its research and development systems to provide solutions to current and future health problems.

Similarly, in terms of equity, it is necessary to align health research to the priorities and needs of the population, especially in those research areas related to the poor. In this sense, the Latin America and the Caribbean Ministers of Health considered in a position paper that the investment in science and technology applied to health in the region is characterized by the absence of explicit agendas for needs-driven research that informs policy design, as well as by limited development of financing mechanism to meet these needs (PAHO, 2007)[2].

This paper reflects the results obtained in five Latin American countries (Argentina, Bolivia, Chile, Paraguay and Uruguay), focusing on the national government's investments research for health in each country. For that purpose, it firstly reviews the main theoretical aspects of this analysis from which research questions arise, and then presents the methodology and the sources of information. This methodology was agreed upon with the research team and allowed a common approach to the national studies presented herein.

[1] Technical Discussion Report, Document A 43, Geneva, 16 May 1990.

[2] Health Agenda for the Americas 2008-2017; Panama City, 3 June 2007.

The teams was made up of Daniel Maceira, project coordinator and principal researcher for Argentina and by the following chief researchers in each country: Fernando Aramayo Carrasco in Bolivia; Sergio Duarte Masi in Paraguay; Guillermo Paraje in Chile, and Delia Sánchez, in Uruguay. Esteban Peralta from Argentina participated in the project as assistant researcher.

Each of the national chapters includes the analysis of public mechanisms for resource allocation, coordination among institutions and prioritization criteria, as well as the national biases of government agencies in public health research in the funded topics. The study does not consider the contribution of the private sector in financing health research, leaving room for future research. The last section proposes a comparative analysis of the outcomes and identifies similarities and peculiarities of the five countries included in the project, as well as the linkage of such research agencies with the need indicators in each country.

The purpose of this volume is to contribute to an open debate on how to establish health research priorities and the criteria considered in Latin American and developing countries. It clearly does not propose to close such debate but instead to facilitate discussions from a public policy standpoint, which must be supplemented by other national cases, within and outside the region, thus adding different points of view.

We wish to thank the Global Forum for Health Research that supported the proposal, showed interest in its implementation and facilitated the World Bank's financial contribution. Our special thanks to Stephen Matlin, Global Forum Director, who encouraged the research process, and to Andrés de Francisco who recognized the need to carry out this study, participated in initial conversations on the proposal and facilitated its implementation.

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Furthermore, our thanks to the participants in the different workshops organized in all five countries at which the outcomes of the research work were presented. Their comments and suggestions enriched the national studies outlined in this publication.

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Theoretical Framework for analyzing the flow of health research funding

Daniel Maceira[3]

1. Introduction

A broader outlook is needed to analyze funding of the health systems and the determining factors of research in this discipline, taking into account the social nature of the goods and services involved in maintaining and/or restoring health, within a public policy framework. There are no doubts about the social nature of the goods and services needed to restore and maintain health, and neither about the status of health as a right reflected in several documents of national and supra-national institutions[4]. Despite the above, the discussion on health and economics is complex since it involves decisions on investment and the setting of priorities related to peoples' quality of life. In this regard, the challenge for economics as a tool to analyze health systems is to find a way of effectively implementing access to the right to health (Maceira y Peralta Alcat, 2008).

A similar challenge arises at the moment of strengthening health research, in order to align the investment on health with population needs helping to improve people welfare, in particular for the poorest and least advantaged people. For research to fulfil this potential, it is essential that it be adequately resourced, within the broader context of financing for health and development (Burke and Matlin, 2008).

The study of any sector involving flow of funds leads to considering interrelations between demand and supply of goods and services. In the case of social goods and services -for instance those linked to sectors such health care and research- there is a special dimension which relates the need for such goods and services to the effective demand for them.

The gap between the effective need and demand for health care services or health research sets forth limitations both in the perception of the needs as well as in the institutional response of the system. From this standpoint, the perception of the need can be explained differently, from the lack of information on the symptoms of certain diseases, which delay or impede a visit to the health service, through to inter-personal differences about the notion of "health" which have an impact on when the person asks for care. From an institutional point of view, deficiencies in the formal health system to meet such needs appropriately can become a barrier to entering the system.

Nations with a lesser relative degree of economic development or the lowest-income sectors of a society are usually more exposed to these problems. Health care systems which bridge the gap between social demands and the supply of formal care and coverage reduce the potential harmful effects of the lack of equity, as well as the gap between effective demand and the population's needs. In the same way, health research is essential for the design and

[3] We thank Martín Peralta Alcat, Esteban Peralta and Eugenia Barbieri for their inputs. Correspondence should be addressed to danielmaceira@cedes.org

[4] The Constitution of the World Health Organization states that «the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic and social condition».

implementation of health policies, interventions and services. Briefly, health research is necessary to achieve better health and health equity.

As it will be developed later, according to economic theory the presence of failures in the way a system performs calls for the need of public (governmental) intervention. Issues related to the structure of supply (in this case, health care and research services), as oligopolies, asymmetric information with respect to the demand, among other factors, require an active role of the State in order to reduce inefficiencies in the allocation of resources. Specifically in health care systems, lack of efficiency in resource allocation relates to social inequity in access, due to the fact that marginal resources are not invested where they are required the most.

This framework is translated into interventions such as the provision of services at public hospitals and health centers, and the funding of horizontal practices for the whole population (vaccines, promotion and prevention, etc.). The same argument can be applied to social investments in health, leaving room for National Innovation Systems. Essentially, and beyond other interventions, the State plays a non-delegable role in setting regulatory schemes to bridge quality gaps and facilitate access. From an economic standpoint, the importance of goods and services supplied and demanded in the health systems require an institutional framework to control operations and to favour common interests. In the same way, a public strategy is needed for health research, in order to prioritize investment on research in those areas which can benefit the health of population with fewer resources. All such standards will aim at having a socially acceptable allocation in terms of efficiency (best results with a minimum amount of resources) and equity (socially responsible equality and justice and appreciation of each individual).

From this point of view, innovation in health as well as research priorities should promote a bridging of the gap between the needs and services offered and support democratic knowledge-dissemination mechanisms, facilitating access to all. This brings about an additional requirement as to the State's responsibilities within the health system.

2. Health Systems and Innovation Systems

All systems related to health maintenance or restoration, as well as those linked to innovation reveal tensions between creation and socially desirable provision. Both sectors are characterized by three elements: uncertainty and asymmetric information of demand, lack of competition and externalities.

“Health” entails asymmetric information between consumers (patients) and suppliers (hospitals, health care centers and health professionals). Patients usually have insufficient knowledge about the nature of their disease and the potential treatments, which give physicians a certain power to behave in an opportunistic manner, a situation which is modeled on the basis of the agency theory (Pauly, 1980). Based on the degree of aversion to risk, payment capacity and alleged health profile, the patient can hire an insurance which -ideally- minimizes the financial risk and provides coverage in case of an illness.

These characteristics, among others, set conditions on the **health system**'s capacity to provide for a socially efficient and equitable allocation of resources. Knowledge generation through research and the dissemination of information arising from such research, increases access probabilities. Access is not only related to treatments necessary to restore health but also to the management, organization or communication practices within the health system to improve contact with the system and optimize the use of resources.

However, the rationale of **activities related to Research and Development (R&D) and the innovation process** also includes operating under idiosyncratic circumstances in which information is incomplete and asymmetric, increasing the challenge at policy level. Information as a public good makes competitive markets provide little incentives to the production of innovations since the providers cannot take over the benefits stemming from their use (Arrow, 1962)[5]. This reasoning provides solutions in the way of market-based rewards as, for instance, patents (Stephan, 1996)[6]. The above brings about a time-related inconsistency problem where any solution can be socially questioned: accepting the existence of patents creates monopolies, with prices that include extraordinary revenues in the medium run. Nonetheless, relying on purely competitive markets does not guarantee a displacement of the knowledge frontiers which is socially harmful in the long term. Therefore, the nature of the innovation process becomes especially relevant since it involves aspects related to health treatments and access to technologies -of any kind- to allow a more equitable dissemination of knowledge arising therefrom.

At the same time, the systemic nature of all innovation processes entails that an organization does not innovate independently from others. For instance, a company which has embarked on a search for innovation is influenced by other firms, competitors, public actors and other organizations. The behaviour of all actors is, in turn, framed within the institutions that must regulate the innovation process (laws, regulations, routines, etc.). These organizations and institutions are components of a system of knowledge creation and trading. Innovations thus arise as an outcome of the "Innovation System" (Edquist, 2000).

Given the heterogeneity between suppliers and financers of goods related to both systems (health services and innovation), prices as well as resource allocation are to a great extent influenced by the negotiating power of each participant. Likewise, the generation of health-related goods and services, on the one hand, and of knowledge, on the other hand, allows strong spillover effects which are not captured by the price system and are therefore under-provided by the market. Lack of coverage for low-income sectors and research deficiencies as regards certain poverty-related treatments and diseases are just some of the examples illustrating this problem.

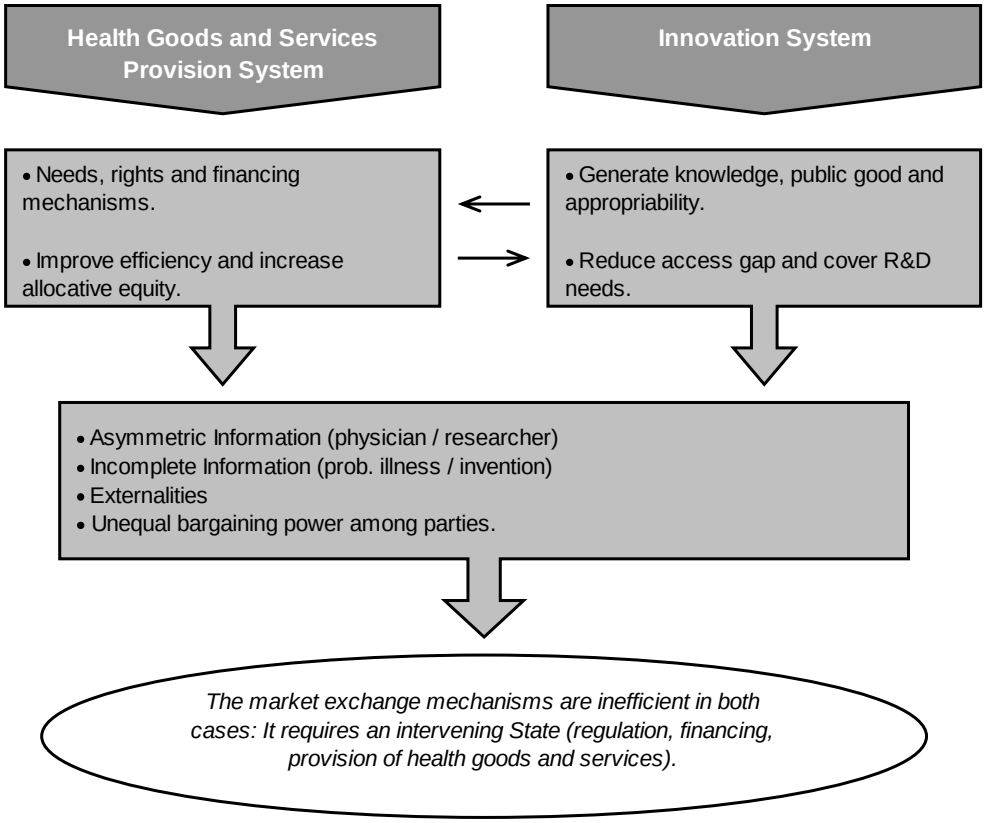
Health research has features inherent in both systems, in the generation of health-related goods and services and in innovation, thus becoming a challenge for policymakers in a field where there is strong interaction among policymakers, researchers and companies. According to certain guidelines of economic literature, the existence of market failures calls for the State's participation to define an intervention structure that allows a reduction of the negative effects as far as effectiveness and equity are concerned. Such interventions can

[5] The two extreme traditions in the analysis of innovation economics are Adam Smith's "invisible hand" and Joseph Schumpeter's "destructive creation". While the former advocated that free market competition would generate endogenous incentives for innovation, the latter argued that only the possibility of acquiring a monopolistic power (i.e. extraordinary gains) would arise among businesspersons the necessary incentive to carry out innovation work. Such extreme arguments, however, would lead to thinking of the possibility of a certain degree or competition (or concentration) where optimum R&D could take place (Loury, 1979). In this regard, Kamien & Schwartz (1972, 1976) show that the more intensive the rivalry between competitors within a given technological career, the lower the amount of optimum innovation activities. Likewise, Scherer (1967), analyzes the R&D decision that a given firm made through a Cournot model, where the symmetrical increase in the number of firms brings about a greater marginal pay.

[6] The use of a patent system has many arguments in favour and against regarding its capacity to create incentives. Often times its rationality is based on the fact that it allows investors to be protected against potential imitations or adaptations (Bessen y Maskin, 1999). The authors, however, prove that when discoveries are sequential (in the sense that each successive invention is used in new inventions) within a static context, the protection stemming from each patent mechanism entails innovation disincentives. An alternative view of the incentives mechanism considers the presence of compensations outside the market, known as "*discovery priority*". Incentives to innovate in this case come from the researcher's need to be the first in making a discovery, obtain the academic community's recognition, the publication of the paper in journals and, eventually, the obtainment of financial prizes (Merton, 1957).

take place in different ways, through different mechanisms of public-private cooperation and with a greater involvement of the State. The selection of each course of action shall depend on the Government's skill to identify social needs, on its regulatory and/or financial capability and on its political preferences.

Figure 1. Parallelism between Health and Innovation Systems



Source: Maceira & Peralta Alcat (2008)

Intimately related to this problem are the priorities established by public authorities. These give rise to criteria that direct public funds for research and the cooperation and complementariness structures between government agencies and with private companies, research institutes, patients' associations, etc.

The political economy applied to health care analyzes these aspects, trying to understand the motivations of each of the sector's leading players (the political power, the Ministry of Health, decentralized public institutions, health workers' trade unions, associations of physicians, patients, pharmaceutical companies, among others), their effects on the systems and sector-based reforms, and the system's capability to meet the population's needs. In the specific case of health research, it consists basically of analyzing the interests, players and ideas that determine the research agenda.

According to the definition proposed by OECD and UNESCO and taken from GFHR (2001), Research and Development (R&D) in health entails creative work based on a systematic process with the purpose of increasing the stock of knowledge, which includes knowledge on mankind, culture and society and its use for new applications. It therefore involves a process of knowledge generation and testing of hypotheses within the medical and natural sciences, as well as social sciences, which encompasses economics and behaviour.

Investment in health research has been the origin of a big progress in the field of health worldwide providing new ways of prevention, diagnosis and therapy to meet health needs. It is therefore a key tool to improve the population's health conditions, meeting the challenges which still exist in this field.

R&D in the field of health is thus a source of knowledge and an input to innovation processes which allow improving the living conditions of the population, with important economic and social effects. However, important scientific advances in health have had a limited impact on developing countries. Although a part of this phenomenon results from poverty and deficiencies in the health systems of these nations, the problem is a lot more complex. For instance, out of the 1,233 new drugs approved between 1975 and 1999, only 13 were meant to be used in tropical diseases (Jamison, et al, 2006). This reflects the meaning of the "10/90 Gap" which shows the lack of coordination between resources targeted to health research and the population's health needs.

This imbalance is connected with limitations inherent in the operation of scientific research and innovation systems[7] which limits the alignment of social interests with those of innovators. As already mentioned, scientific research is related to knowledge- generation, which is considered a public good, and the innovation process is uncertain and calls for important upfront investments. It is thus necessary to develop supplementary mechanisms between the private innovative sector and public authorities so as to identify socially desirable instruments for innovation and dissemination. This clearly happens within a complex process of economic policies which usually goes against "optimum" developments since the latter entail many negotiation mechanisms.

3. Innovation and Technology

Innovation is the "transformation of an idea into a new or improved tradable product, or into an operational process in an industry or trade, or into a new social service method" (OECD, 1992). This definition states the purely commercial nature of innovation: an invention or discovery turns into an innovation when a use is encountered for the finding.

All innovations entail a modification of the current situation, the way of doing things in an organization, a re-analysis and/or re-appraisal of prior and new activities. Schumpeter (1934) identifies five types of innovation: new products, new production methods, new supply sources, exploitation of new markets and new forms of business organization. Furthermore, innovations can be considered major or minor ones. The latter are incremental or marginal, and are changes made to an existing matrix. In these cases the idea is to add productivity to an already known process, including specific aspects generally related to scale, idiosyncratic resource provision or differences in preferences. In developing countries, these mechanisms for technology generation were traditionally the most frequent (Katz, 1976).

It is important to differentiate between invention and innovation. The former refers to an idea that comes up for the first time for a new product or process, while innovation, as was already defined, is the first time an idea is traded. In some cases invention and innovation are connected and are difficult to distinguish (for instance, in biotechnology). Nonetheless, in most cases there is a considerable time lag between both notions, so that the innovators and inventors can play separate roles.

Inventions are normally created in environments such as universities while innovations generally take place within the framework of a company, combining different types of

[7] Such failures are connected with incentive problems which often times are blamed on R&D development and implementation and on innovation.

knowledge, capacities, installations and resources. An innovation is therefore the outcome of a process which links several innovations. That is one of the reasons why it is common to resort to a system perspective than to focus on an individual invention or innovation. From this argument it can be inferred that knowledge-generation processes, in order to be considered socially efficient, should somehow coordinate the interests of the players involved in the invention process, based on the above rationale, with the interests of the potential beneficiaries of the innovation.

In principle, innovations are considered random, non economic and exogenous phenomena. Schumpeter changed this view, emphasizing a given behaviour which involves leadership and vision, which are two requirements related to "entrepreneurs". He then states that the notion of innovation is the outcome of an ongoing cooperative struggle between individual entrepreneurs and social inertia.

From this point of view, the innovation model follows a series of chained links arising from a systemic nature (Kline y Rosenberg, 1986). Innovation activities of a firm significantly depend on external sources, thus stemming from a set of related activities or players. This vision allows focusing on working networks, thus favouring complementariness.

4. National Innovation Systems

The expression "National Innovation System" (NIS) was used for the first time and published by Freeman (1987). He defined it as "…the network of institutions of the public and private sector whose activities and interactions initiate, import and disseminate new technologies". Despite the holistic vision and the inter-disciplinary perspective of the notion, some authors (Nelson & Rosenberg, 1993, Lundvall, 1992, among others) voice difficulties as to its definition, application and ground rules that govern a NIS. Edquist (2000) proposes a set of activities as NIS components, for instance: (i) provision of research and development (R&D); (ii) creation of human capital, production and reproduction of skills to be used in R&D activities; (iii) generation of new market products; (iv) creation of institutions which have an influence on innovative organizations and innovation processes, providing incentives or eliminating obstacles; (v) funding of innovative processes and other activities which can facilitate trade and knowledge for their adoption.

Within this framework, the main components of a National Innovation System are organizations and institutions. Within the former are the formal structures created for specific purposes: companies, universities, public agencies responsible for innovation and competition policies, etc. On the other hand, institutions are a set of standards, habits, routines, established practices, laws which regulate relations and interactions among individuals, groups and organizations, that is to say, the ground rules for organization interaction. For instance, patent laws, rules and standards which have an impact on the relationship between universities and firms. Institutional differences between countries give rise to different coordination modalities in the relationship between organizations, as well as different mechanisms for setting priorities to the extent they have an impact on the existence and ways of relating to one another of the organizations.

Therefore, the greater or lesser capacity of a health innovation system in a country to bridge the gap to access knowledge and treat certain diseases or topics partly depends on the prioritization mechanisms of the State that created the institutions. The State, interacting with other players of the innovation system, sets its limits and the effectiveness of the resulting strategy[8]

[8] There is no consensus on the functions or activities to be included in an innovation system. Edquist (2000) considers that NIS' priority duty is the quest for innovative processes for which is should carry out a series of

The Health Innovation System is defined as a set of organizations, institutions and activities whose main objective is to generate high-quality knowledge that can be used to promote, re-establish or maintain the population's health status (Pang et al. 2003). The definition includes all players involved in knowledge generation and use of the outcomes both in the public and private sectors. From this point of view, the health innovation system of a country is the intersection between the innovation system and health system.

From this standpoint, an effective National Innovation System in the field of Health must (i) manage; (ii) finance, (iii) create and maintain resources, and (iv) produce and use scientific knowledge.

Management includes four components: defining and articulating a national innovation system in the field of health; identifying priorities in health research and coordinating the adherence of existing institutions; specifying and monitoring ethical standards in research; and monitoring the coordinated operation of the system.

Financing mainly calls for ensuring the necessary financial resources for research and allocating them in an optimum manner to the essential functions of the system. Creation and maintenance of resources refers mainly to the capacity of the NIS in the field of Health to ensure the necessary levels of human resources and capital to meet the established objectives.

Finally, scientific knowledge generation and utilization includes several components, among which it is worth mentioning the dissemination of outcomes through publications, and their use in the development of new tools (drugs, vaccines and other applications) to improve the population’s health status and promote the use of research to feed into information policies, strategy design and the development of certain practices within the health system.

Based on bibliographical reviews, a series of interests involved in health research can be identified, both monetary and non monetary, considered not only as an input for the health system's development but also as an independent system, which goes beyond the nature of the invention. Furthermore, the need to establish regulatory frameworks, that are duly disseminated, standardized and executable, is a part of the responsibilities/powers of the State in R&D. This requirement becomes more evident in the fields of knowledge related to health research since it combines a social good structured into two dimensions: as a generator and disseminator of knowledge (equality in access to information) and in the quality and life expectations of the population (equality in access to health services).

The National Innovation System in the field of Health (NISH) arises as a public response to these requirements for information, financing, access and control. This however faces decision makers with a broad range of challenges both regarding prioritization mechanisms as well as coordination criteria with activities carried out by other sectors of society (private research centers, laboratories/pharmaceutical companies, international organizations, etc.) within a scenario of limited financial resources.

Consequently, the need to establish prioritization mechanisms on many occasions requires a cost-effectiveness analysis which weights options that are difficult to compare. How can

activities, among others: i) creation of new knowledge, mainly in engineering, medicine and natural sciences; ii) creation of human capital, production and reproduction of skills to be used in R&D activities; iii) creation of new market products; iv) creation and modification of the organizations' needs to develop new fields of innovation and regulations and standards that have an impact on innovative organizations and innovation processes, providing incentives or eliminating obstacles to innovation; v) financing of innovative processes or other activities which can facilitate trading and knowledge for their adoption; and vi) provision of relevant consulting services for innovative processes (transfer of technology, trade information, legal advisory services).

preeminence of one methodological approach over another be established? How can the impact on population coverage of research work in social sciences or service management be compared to basic research? Is it possible to generate cross-learning mechanisms and synergy within an NISH made up of a set of institutions with different duties in the government structure (Ministries of Health, Education, Science and Technology)?

In this context, the paper presents an analysis of the National Health Innovation Systems in five Latin American countries: Argentina, Bolivia, Chile, Paraguay and Uruguay, based on the use of a common analysis methodology, focusing on the national government's investments research for health in each country**.** The purpose is to get to know the NISH structure in light of the population's needs in each country. The implementation of this working agenda focuses on answering the following questions on research:

Which are the institutional arrangements established in each country to promote, develop and support their NISH?

Is there a prioritization mechanism in health research within the framework of a national innovation system?

Is there coordination among public financing institutions?

Has there been an increase throughout time of funding of research on priority topics given the countries epidemiological profile?

Are there idiosyncratic biases in research topics, that is to say, is it possible to underscore any relationship between countries and also between regions in a country and the prioritized research topics?

Methodology

***Daniel Maceira*[9]**

Once the analysis framework had been established to insert the topic of health research and the role of the State in coordinating a National Innovation System in the field of Health (NISH), the purpose of this research was to analyze the National Health Innovation Systems in five Latin American countries (Argentina, Bolivia, Chile, Paraguay and Uruguay), focusing on the national government's investments research for health in each country and basing the analysis on a common methodology.

From this, the chapters that follow will analyze the flow of financial resources for health research, through national public agencies in the countries under consideration in the five-year period 2002-2006.

In each case, the institutional arrangements established in each country to promote, develop and support their NISH will be considered. In the same way, the institutional arrangements made to invest resources in the sector, and the characteristics of each of them and the origin of allocations (direct ministerial contributions or open competition for research funds) will be identified. When allocations are not concentrated in a single institution, an attempt will be made to establish whether there are specific coordination mechanisms or competencies for each participating agency.

In addition, given the national innovation system framework, the document intends to identify the prioritization mechanisms in health research in these countries. This paper particularly attempts to establish the relative share of each research topic with the purpose of carrying out an analysis of the determining factors of investment in health research. In relation with this, the paper also intends to identify the existence of idiosyncratic biases in research topics. The idea is to find the existence of any relationship between regions and the prioritized research topics in that country.

In order to identify comparable analysis mechanisms among nations on the flow of research funds, it was necessary to select a term for the study, in this case, the five-year period 2002-2006; and also agree on a fund annualization mechanism to facilitate follow-up of fund evolution. This was necessary because of how frequently resources are allocated bi-annually or tri-annually to project implementation, thus requiring homogeneous mechanisms for studying resource allocation during the different periods. These agreements allowed analyzing within each country, and then comparing among countries, the evolution of funds and also collating institutions and particularly research topics throughout time.

Similarly, the objective is to provide the reader with consistent information on the targeting of public funds, identifying an alignment of the population's health needs and the government research strategy in each country. The difference between epidemiological and health profiles of the selected countries leads to assuming a certain heterogeneity in government investment in the field of health.

[9] This chapter is the outcome of a Workshop called FISAL (Funding of Health Research in Latin America), held at CEDES in September 2008. We wish to thank Fernando Aramayo Carrasco, Sergio Duarte Masi, Guillermo Paraje, Delia Sánchez and Bárbara Lignelli for their inputs and contributions.

Finally, from the above it is possible to point out that the purpose of this study is to determine what resource allocation mechanisms are used to assign public sector research funds within the framework of a National Innovation System in the field of Health (either explicitly or implicitly defined). A simplified system analysis scheme is used to identify potential State intervention mechanisms. This political economy scheme is based on the paradigm Structure-Behaviour-Performance (Scherer, 1967) reformulated by Maceira, 1998, and considers that all systems are made up of players who interact according to their objectives and action capacity. The mapping of such players is the System's Structure and the way in which they relate to one another sets the scene for developing interaction, coordination and negotiation strategies. Such strategies are more or less effective according to the operational capabilities of each player, within a context of uncertainty on the objectives and actions of the other participants.

The performance of this system thus results from the strategic interaction of the players within the sector's structure, influenced by certain initial or basic conditions of the analyzed sector. These basic conditions can be considered exogenous variables of the system, based on which the participants must guide their behavioural objectives and strategies.

The above paradigm includes public policies. In order to achieve certain systemic objectives (established through sector-based performance indicators), the State has the possibility of acting on external components, thus changing the system's basic conditions, and on the structure or strategic behaviour of its players.

There are different intervention modalities that range from the definition of standards, rules and control mechanisms (institutions mentioned in the previous section), through to the direct supply of goods and services. In the first case, the definition of entry barriers and quality controls are rules that affect the system's structure (who participates) and the strategy deployed by each (how do participating players relate to one another). At the other end, public policies can define specific lines of funding for certain topics defined as priorities, or become directly involved in the production of goods and services.

From the standpoint of an NISH, the State's potential participation differs in each case. It could include the definition of a normative framework to identify the quality of public and private research (mechanisms of juries, product patenting, ethics committees, product certification and authorization for R&D plants) and (or alternatively) the financing of priority research lines in the field of health. Likewise, government policy can either facilitate the import of critical inputs at preferential rates in developing countries, or the creation of research institutes funded from government budgets. The State, therefore, based on its institutional and financial capacity, takes policy decisions which operate on basic conditions of the innovation system (e.g. rate reduction), affect the structure of the system (e.g. defining entry barriers through regulatory agencies or the creation of public institutes), or attempt to influence the players' strategies (e.g. providing financing lines for priority projects).

According to this approach, a categorization of research projects is proposed to classify them along two lines. The first one is related to the purpose of the study whilst the second highlights the nature of the research methodology.

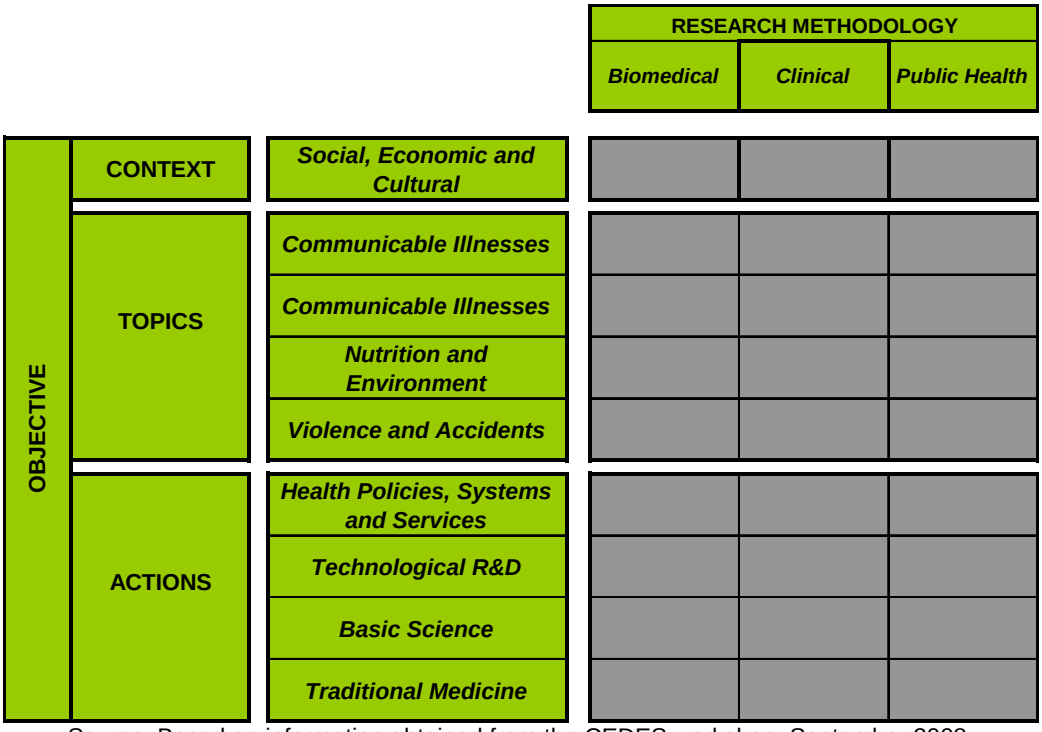
The purpose of the research carried out by projects funded with government resources in each country can be targeted to understanding/deepening/clarifying aspects related to the health context as well as elements included in the "structure" of the country's health problems. Alternatively, research can be aimed at considering the health actions or strategies arising from such issues or problems.

Within the first group, related to research lines on basic conditions are the papers addressing the social, economic and cultural determining factors of health problems, which can be

broken down into four groups linked to traditional profiles: communicable diseases; non communicable diseases; addictions and violence; and nutrition and environment-related illnesses.

The third bloc of project analyzes health actions or interventions. Therein, four alternative lines were classified. Firstly, those related to research in health programs, systems and services, normally linked to management issues. Secondly, there are the technological research and development projects targeted to the production of health-related equipment or techniques and software. A third kind of project aims at basic research carried out essentially in laboratories. The fourth line of research with the "health action" group includes those projects that prioritize traditional and alternative medicine topics[10].

Figure 1. Matrix of Health Research Projects



Source: Based on information obtained from the CEDES workshop, September 2008.

These nine thematic research blocs, classified by purpose of the study, were crossed with the research methodologies used, which were structured into three groups: basic research, clinical research and public health research.

The outcome is a matrix of 27 categories which were used to classify research projects financed by government authorities in the five countries included in this study.

Hereafter are the definitions used to identify each of the research objectives and methodologies present in the countries under consideration. Such definitions were deemed to be the basis to differentiate between topics in the five national studies and to classify each of the projects financed by the national government innovation system, by financing

[10] Additionally, in the case of Chile another “action” category was included: “mental illness”, given its high burden of disease. In the rest of the countries mental illness was included into the non-communicable illness category.

institution and project. When a research project includes more than one analysis object, the more specific ones were weighted.

1. Research Methodologies

Biomedical Research as defined by OECD (2005) this covers the study of diseases and specific conditions (mental or physical), including detection, cause, prophylaxis, treatment and rehabilitation of patients; the design of methods, drugs and devices used to diagnose, support and maintain an individual during and after treatment of a specific disease or condition; scientific research required to understand vital underlying processes which affect the disease and human well-being, including areas such as cellular and molecular pathology of the disease, genetics and immunology. The complete list of activities includes clinical trials and research in labs, the study of exposure to environmental agents and behavioral risks.

According to the Declaration of Helsinki, **Clinical Research** combines research and professional care. The UK Medical Research Council (2005) defines it as “an investigation in human subjects, designed to answer questions on health and disease. Besides a direct examination of individual patients and populations, it also includes the testing of biological samples and personal data of individual participants. And furthermore, research among volunteers or among groups of apparently healthy individuals when these tests are related to the investigated disease."

Public Health Research has the essential purpose of looking into, analyzing and explaining the distribution of health conditions among the population, their determining factors, and the socially organized answers to face collective health problems. Therefore, its purpose is to generate the necessary knowledge to understand the causes and factors that influence the population's health conditions, as well as to evaluate and explain the effects on those conditions of the different policies, interventions and mechanisms of system organization and health service provision (de los Ríos, 1999).

2. Research Objectives

Research in health-related socioeconomic and cultural aspects: defined as the spaces in which relations related to health, disease and their context take place, the mechanisms of influence and feedback. According to WHO, most of the health problems can be blamed on the people's socioeconomic conditions. In health policies there has, however, been a prevalence of solutions centered on the treatment of diseases, without appropriately incorporating interventions on the "causes of causes", such as, actions on the social environment. Consequently, health problems are still in place, health and health care inequalities have increased and the results obtained with health interventions focused on healing have been insufficient and do not allow compliance with the Millennium Development Goals. Among the topics included within the “social determining factors of health” WHO lists: living conditions during children's early development stage, health systems as social determining factors, working and employment conditions, effects on health of some globalization processes, design and organization of programmes to control priority diseases for public health, extreme housing conditions, social exclusion and necessary methodologies to be used for assessing interventions and policies on social determining factors in the field of health.

Communicable or Transmissible Diseases: any disease caused by an infectious agent or specific parasite, or by their toxic products or the toxic products of other biological agents. They happen because of the transmission of that agent or its products from an infected individual or animal or from a reservoir to a susceptible host. They can be directly or

indirectly transmitted by means of an intermediate host of plant or animal origin, or by a vector or the environment (Ministry of Health, Chile, 2000).

Non-communicable chronic diseases (NCCD): These are a group of heterogeneous sufferings that contribute to mortality through a small number of outcomes (diabetes, heart diseases and strokes). Deaths are the result of a process that started years ago. The natural evolution of diabetes or heart diseases can be modified with actions that change the clinical course of conditions determining their incidence. Among them, it is worth mentioning overweight and obesity, abnormal concentrations of blood lipids, hypertension, smoking, a lack of exercise, an inappropriate diet and the metabolic syndrome. The above characteristic provides opportunities for prevention, development of forecasting tools and the creation of pharmacological-economic models. For instance, if the modifications to the national prevalence of these anomalies are known, it is possible to forecast the damage of non communicable chronic diseases and assess the effects of preventive actions (Córdova-Villalobos et al.2008)

Nutrition and the Environment: This refers to those topics of health research stemming from the analysis of specific determining factors related to food intake and the environmental context (water, sanitation, pollution, etc.) and behaviour linked thereto, beyond the organization and operation of the health system. According to the WHO Food Security programme (2005), diseases related to the above topic have an infectious or toxic origin caused by agents that enter the body through food intake, metals and persistent organic pollutants.

Violence and Accidents: The deliberate use of physical force or power, either effectively or menacingly, against oneself, another person, a group or community which causes or has the possibility of causing injuries, death, psychological damages, development alterations or deprivation (WHO, 2005 a). This includes the following categories within the international classification of diseases: injuries, suicide, homicide, injuries produced by firearms, and all other injuries caused by weapons. This category also includes accidents and behaviour that is risky for people's health, outside the patterns included in the previous groups.

Health Policy and Systems Research (HPSR): According to the Alliance for Health Policy and Systems Research of the World Health Organization (2005 b), this has been defined as the production and application of knowledge to improve how societies organize themselves in order to achieve health goals. It encompasses how societies plan, manage and finance health services as well as research on the role and interests of different actors in the health system. HPSR is a topic area, not a discipline and draws upon a variety of contributing disciplines, including economics, sociology, anthropology, political science and epidemiology.

Technological Research and Development: This category is related to the creation of technological innovations applied to the development of inputs for their use or implementation in the health system (equipment, hardware, software, etc.). Technological R&D has the purpose of supporting an improvement in quality and a cost reduction in products and services in the industrial and other sectors, in agriculture, health, etc. Technological R&D projects are usually implemented by groups of researchers from different disciplines and their related problems are interdisciplinary (Lara Rosano et al., 1998).

Basic Research: refers to pure study and research in sciences for increasing our scientific knowledge base. According to the Frascati Manual (OECD, 2002), basic research is theoretical or experimental research carried out primarily to acquire new knowledge on the underlying grounds of an observable phenomenon or event, with no specific application or use. According to OECD (1993) pure basic research is that which is carried out to improve knowledge, with no specific quest for social or economic recognition in the long term, with no

effective efforts to apply such results to practical problems or to transfer such results to sectors responsible for their application.

Traditional, alternative, supplementary medicine: According to the World Health Organization (2003) these are health practices, knowledge and beliefs which include medication based on plants, animals and minerals, spiritual therapies, manual techniques and exercises, applied individually or in a combined manner to treat, diagnose and prevent diseases or maintain well-being. According to this source, countries in Africa, Asia and Latin America use traditional medicine to cover some of their primary health care needs. In Africa, up to 80% of the population uses the above techniques while in industrialized countries adaptations of traditional medicine are known as "supplementary" or "alternative"[11].

[11] The Cochrane Collaboration about evidence-based medicine defines supplementary medicine as all those healing practices and resources that go side-by-side with theories and beliefs which are not intrinsic to the politically prevailing health system in a society or culture within a given historical period. Some have not agreed with these proposals, pointing out it is not true that alternative medicine is totally outside the conventional system. Indeed some schools of medicine, hospitals and other US health services offer non conventional medicine as an alternative therapy and field of learning. In Peru, for instance, some schools of medicine have hosted traditional medicine conferences. It has been pointed out that, unlike classical Western medicine, many of these supplementary disciplines not only claim alleviation of symptoms but also restoring of welfare, in a process of self-healing framed within a “holistic” perspective (Peña & Paco, 2007).

Public Research on Health in Argentina. Financing and Priorities

Daniel Maceira[12]

1. Introduction

According to the World Bank (2009), in 2007 Argentina had a population of approximately 40 million inhabitants and a per capita Gross National Income (GNI) of 12,990 dollars adjusted for Purchasing Power Parity, the highest in the region. In absolute terms, GNI is 513 billion dollars (PPP), the third in Latin America after Brazil and Mexico.

The country's social and health indicators show a Human Development Index of 0.860, which ranks the country 46th within the global context (UNDP, 2008). Urban population accounts for 90,1% (The World Bank, 2009), out of which 12.3 million approximately live in Greater Buenos Aires (INDEC, 2003).

In addition, in regard to territorial development, the leading area, defined as the one with the highest measure of welfare (income or consumption or GDP) per capita is the Ciudad Autónoma de Buenos Aires, which according to the latest census has a population density of 13.676 inhabitants. In the opposite place is situated Santiago del Estero, the lagging area, with 6 inhabitants per km^2.

In relation with indicators of population health, Infant Mortality Rate was 14 per thousand in 2007, while life expectancy at birth for that period was 75 years. In the same way, for 2004 age standardized mortality rate for non-communicable diseases was 515, of which cardiovascular were 207, while cancer 139 and injuries 46. Finally, for the same year the distribution of years of life lost by broader causes was 67% for non communicable diseases, 18% for communicable and 15% for injuries. (World Health Organization, 2009).

The Argentine health system is highly fragmented in its funding, management and service provision (Maceira, 2008). To some extent, investment policies in public research on health suffer the same segmentation difficulties. Although there are national agencies that finance knowledge generation, either of a general nature or specific to the health sector, there are also provincial institutions which provide resources for research in this field. As to the national scope and scale, federal agencies that support research are the prevailing players and are thus the purpose of this study.

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Table 1: Argentina: Indicators Overview

	Demographic and socioeconomic	
1	Population (millions) (2007)	40
2	Urban Population (% of total pop.) (2005)	90,1
3	Human Development Index (HDI) / Country Position (2006)	0,860 (46)
4	Population living under the poverty line (% living on < 1,25 u$s per day) (2000-2006)	4,5
5	Adult literacy rate (% ages 15 and above) (2006)	97,6
6	Access to improved drinking water sources (%) (2006)	96
7	Gross National Income (GNI) PPP $ billions (2007)	513,0
8	Gross National Income (GNI) PPP $ per capita (2007)	12,990
	Mortality and burden of disease	
9	Life Expectancy at Birth (years) (2007)	75
10	Infant Mortality Rate (IMR) (probability of dying between birth and age 1 per 1000 live births) (2007)	14
11	Age standarized Mortality Rates by Cause per 100000 population (2004)	
	Non-communicable	515
	Cardiovascular	207
	Cancer	139
	Injuries	46
12	Distribution of Years of Life Lost by Broader Causes (%) (2004)	
	Communicable	18
	Non-communicable	67
	Injuries	15
	Health expenditures	
13	General Government Expenditure on Health as % of Total Government Expenditure (2006)	14,2
14	Per capita Government Expenditure on Health in Dollars (PPP) (2006)	1665

Sources/Notes:

World Bank, World Development Report 2009 (1, 2, 7, 8)

United Nations, United Nations Development Indices 2008. (3, 4, 5, 6)

World Health Organization, World Health Statistics 2009 (9, 10, 11, 12, 13, 14)

The paper will particularly address CONICET (the National Council for Scientific and Technical Research) and SECyT (the Secretariat for Science and Technology, placed in the structure of the pertinent Ministry). These are the main mechanisms to support research in Argentina, either through national fellowship programs and a Career of Scientific Research in the former case; or through funds allocated to specific technological development and research projects, in the latter case. The National Ministry of Health also directly manages two systematic research initiatives. The first, is a program called *Salud Investiga* (Research by Ministry of Health), which grants research fellowships and, just like in the two cases mentioned above, supports projects arising from public competition. The second initiative is ANLIS (the National Administration for Health Research Institutes and Laboratories), which focuses on financing lines of work at public institutions.

The following sections briefly describe the characteristics of these institutions within the National Innovation System of Argentina, analyzing the scope of each of them, their evolution throughout time and their biases in terms of fields of work financed, on the basis of the categories established in the previous section. The study is supplemented by a description of the resource allocation criteria by age group, gender and geographical region, to then conclude with the identification of specialization patterns among funds and an exploration of the determining factors for funding public research in Argentina.

2. Science and Technology in Argentina

According to Chudnovsky & López (1995), the origin of the current science and technology system in Argentina goes back to the 1950s as from when four clear-cut stages can be identified. The first stage is placed within the context of the import substitution industrialization model and the emergence of new institutions in a situation of scarce local supply of science and technology. Within this framework, innovations were essentially adaptations and, therefore, there was not much Research and Development (R&D) funding by the private sector (Katz & Bercovich, 1993). Until the enactment of Law 23,877 in 1990, no lines of credit were targeted to funding technological innovation projects in the productive sector, relegating science and technology policies to a secondary level (Aspiazu & Nochteff, 1994), where public institutions and agencies carried out essentially administrative duties.

The second stage is the 1969-1976 period in which, according to Chudnovsky & López, prevalence of the laissez-faire notion in technology was left aside through the enactment of the first two laws on transfer of technology (1971 and 1974) and the creation of the National Council for Science and Technology (CONACYT), under CONICET. In any case, science and technology policies were never integrated into economic and industrial initiatives. As from the 1976 military dictatorship there was a progressive return to laissez-faire policies, through the most natural and immediate mechanism of imports. Within this context, in 1977 a new law was enacted on transfer of technology and, in 1981, Law 22,426 was passed to significantly deregulate the technology import regime.

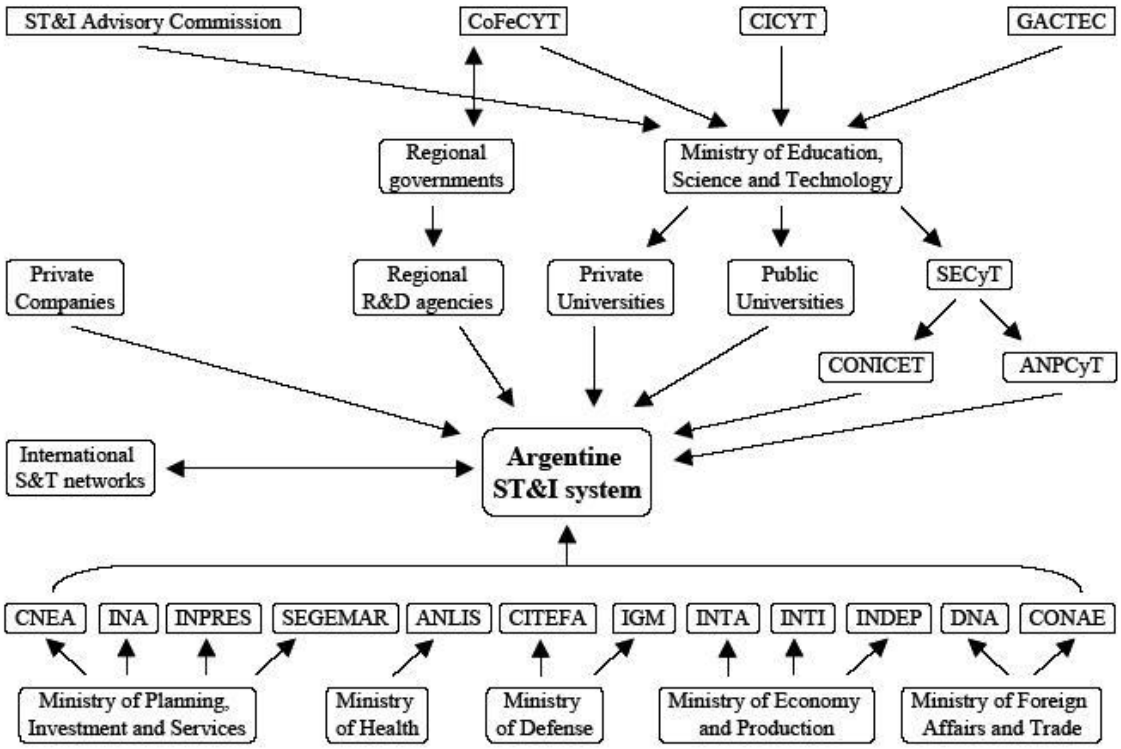
During the 1980s and despite the complex Argentine macroeconomic context, the Advisory Working Group on Technological Development was created (1987) for setting a development policy in this field and coordinating the activities of existing agencies. Within this framework, science and technology slowly expanded and, as from 1990, there was a gradual recovery of the budget allocated to the area. The country did not have a coordinated and explicit policy. However, according to Chudnovsky & López (1995, 1998), a process unfolded, which led to an increase in resources assigned to applied research and transfer of technology, thus enhancing the bonds between the science and technology and productive sectors and improving the levels of self-financing of official institutions. Several mechanisms were developed for this purpose: for instance, credit incentives, productivity promotion programs and the restructuring of institutions.

At present, the Science, Technology and Innovation system in Argentina is very complex given its institutional, financial and program diversity which contributes to a strong disarticulation and fragmentation of the system, and establishes weak bonds between institutions (Chen & Dahlman, 2005). With the purpose of facilitating institutional planning, a science and technology plan was approved in 1997, formally adopting the idea of a national innovation system and articulating initiatives to foster R&D in the public and private sectors (Apólito, 1997).

Law 25,467 (2001) legally recognized several institutions (Figure 1). Among them, the Cabinet for Science and Technology (*Gabinete de Ciencia y Tecnología*, GACTEC) (1996) in charge of updating the national plan and fixing the research budget sponsored by the federal government; the Federal Council for Science and Technology (*Consejo Federal para la Ciencia y Tecnología,* CoFeCYT), for promoting a balanced development of research activities; the Inter-agency Council of Science and Technology (*Consejo Interinstitucional de Ciencia y Tecnología,* CICYT), in charge of optimizing the use of resources; the National Science, Technology and Innovation Advisory Commission (*Comisión Nacional Asesora de Ciencia Tecnología e Innovación,* ST&I Advisory Commission)), responsible for designing and implementing the national plan; the Department of Science, Technology and Productive Innovation (*Secretaría de Ciencia, Tecnología e Innovación Productiva,* SECYT), within the structure of the Ministry of Education, Science and Technology, in charge of coordinating

legislation, allocating budgetary resources and carrying out a statistical analysis on research and innovation; the SECYT sponsors the National Agency for the Promotion of Science and Technology (Agencia Nacional de Promoción Científica y Tecnológica, ANPCYT), which manages the FONCyT and FONTAR, that are funds with the purpose of subsidizing research activities, financing technological innovation and streamlining projects; and the National Council for Scientific and Technical Research (*Consejo Nacional de Investigaciones Científicas y Técnicas*, CONICET), created in 1958 to promote and carry out research work (Thorn, 2005).

Figure 1. Science, Technology and Innovation System in Argentina

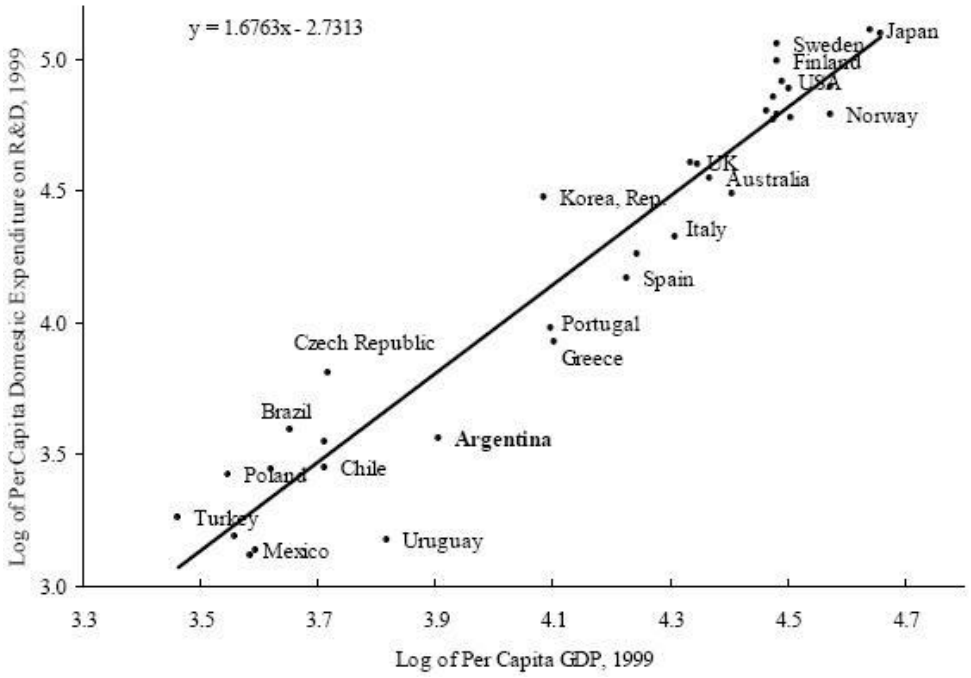


Source: Thorn. The World Bank, 2005.

In 1996, public expenditure on science and technology accounted for just over 0.33 percent of GDP, in which applied research (50%) is the most relevant item. In that year, 72% of the pertinent national budget was targeted to four institutions: CONICET, INTA (National Institute for Agricultural Technology), National Universities and the National Commission for Atomic Energy –CNEA, by its Spanish acronym (Chudnovsky and López, 1998).

In 2004 Argentina's spending on R&D accounted for 0.44 percent of GDP. Figure 2 illustrates the ratio between the logarithm of domestic per capita spending on R&D and the GDP per capita logarithm. Within this outline, Argentina is placed below expected levels (0.81 percent of GDP) taking into account income for this period (Thorn, 2005), although above expected levels compared to the remaining Latin American countries, except for Brazil. Finally, in that same year, government agencies and public universities represented approximately two thirds of R&D financing and implementation (Thorn, 2005).

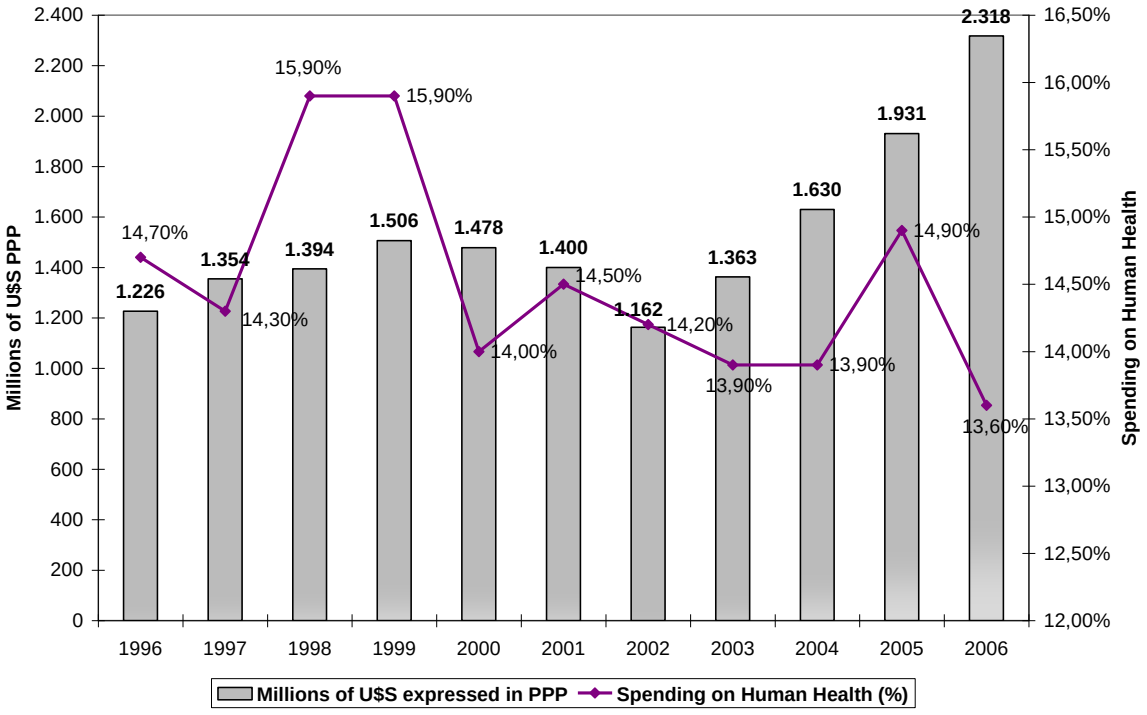
Figure 2. Investments in R&D relative to GDP per capita, 1999



Source: Thorn. The World Bank, 2005.

In 2006, financing in research totaled 2,31 billion dollars PPP (0.49 percent of GDP), following the upward trend which started in 2002 (see 3).

Figure 3. Total Spending on R&D and Share in Spending on Health Research (in U$S PPP)



Sources/Notes:
Annual "Science and Technology Indicators." Series SeCyT 1996-2007.
PPP: Purchasing Power Parity
The dollar amount is obtained using the average exchange rate of the Central Bank
The dollar amount expressed in PPP is obtained by applying the index of purchasing power parity published by the World Bank.

Law 25,467 on science, technology and innovation entrusts the State with the funding, resource allocation and quality regulation of activities targeted to research and development. Argentina now has three entities which set guidelines for the production and funding of different tasks related to health research: the Ministry of Science, Technology and Productive Innovation (MINCyT), the Ministry of Education (ME) and the Ministry of Health (MSAL, by its Spanish acronym).

The first of the Ministries has two decentralized institutions, the National Agency for Scientific and Technological Promotion (*Agencia Nacional de Promoción Científica y Tecnológica* - ANPCyT) and the National Scientific and Technical Research Council (*Consejo Nacional de Investigaciones Científicas y Técnicas* - CONICET)), and is also in charge of the Argentine IT System for Science and Technology (*Sistema Informático de Ciencia y Tecnología Argentino* - SICyTAR). The ME manages and promotes the Incentive Programme for Teachers-Researchers at National Universities, in which one of the areas of research is Medical Sciences. On the other hand, MSAL has two agencies in its structure that regulate and develop and finance, respectively, research activities: the National Administration for Drugs, Food and Medical Technology (*Administración Nacional de Medicamentos, Alimentos y Tecnología Medica* - ANMAT), as a regulatory agency, and the National Administration of Health Institutes and Laboratories (*Administración Nacional de Laboratorios e Institutos de Salud* - ANLIS). Furthermore, within its structure it has the *Comisión Salud Investiga* (Commission on Research by the Ministry of Health, former CONAPRIS), in charge of carrying out the selection and of granting research fellowships (Ortiz, et al., 2008).

In the case of ANPCyT and CONICET, the criteria for selecting fellows, researchers and projects lies on the opinion of experts and peers, based on mechanisms to periodically review outcomes. On the other hand, through the *Comisión Salud Investiga*, the Ministry of Health sets working objectives and priorities based on the opinion of experts, surveys and the development of a combined strategy matrix. Within the framework of research coordination, an agreement was signed between MINCyT and MSAL in 2006, with the purpose of implementing the “Bicentennial” National Strategic Plan on Science, Technology and Innovation 2006-2010 (Ortiz, et al., 2008).

3. Institutions related to Government Financing of Health

3.1. National Scientific and Technical Research Council (*Consejo Nacional de Investigaciones Científicas y Técnicas* - CONICET)

CONICET is the main agency for promoting science and technology in Argentina. It was created by Decree/Law No. 1291 of 5 February 1958. It is headed by a board composed of public and private stakeholders in the Argentine Science, Technology and Innovation System (Thorn, 2005).

Argentina has raised the need to articulate their institutions in a national innovation system for the resolution of specific problems or generation of knowledge of future application. Within the future framework law to encourage and promote the Plan and the National Science and Technology emanated from the Secretary of Science Technology and Graduate Studies (SETCIP), CONICET raises the inter-linkages as a means for the formulation of concrete action plans and setting priorities.

CONICET was set up as an independent agency, within the structure of the President’s Office and financed with National Treasury funds, through the Secretariat of Finance, Ministry of Economy. It was provided with a wide range of instruments: the Careers of Scientific and Technological Researcher, Support Staff for Research, the granting of

fellowships, the financing of projects and Research Executing Units. It also establishes bonds with similar international governmental and non governmental agencies.

The career of Scientific Researcher has allowed the development of a systematic funding model for Science and Technology in Argentina, using evaluation mechanisms for admission to the career, the development of continuous research lines and promotion systems by categories linked to the professional performance of the staff members. Furthermore, it offers fellowships aimed at supporting new researchers and it also systematically calls for the submission of projects. It carries out its activities in four big areas: 1) Agriculture, Engineering and Architecture; 2) Exact and Natural Sciences, 3) Humanities and Social Sciences; 4) Biological Sciences and Health.

3.2. National Agency for the Promotion of Science and Technology (*Agencia Nacional de Promoción Científica y Tecnológica* - ANPCyT)

This agency was created by Decree 1660 of 1996 and was set up as a national institution within the structure of the Ministry of Science, Technology and Productive Innovation. Through the Scientific and Technological Research Fund (FONCyT) and the Argentine Technological Fund (FONTAR), it promotes the financing of research projects, mainly using resources from the National Treasury and IDB loans, among others. Its organization, financing and administration structure is managed by the Functional, Financial and Administrative Unit (UFFA, by its Spanish acronym).

The **Scientific and Technological Research Fund** (***Fondo para la Investigación Científica y Tecnológica*** **- FONCyT**) is a part of the National Agency for Scientific and Technological Promotion and until December 2007, it was placed within the structure of the Secretariat of Science and Technology (SECyT), Ministry of Education, Science and Technology but is currently under the Ministry of Science, Technology and Productive Innovation. FONCyT's mission is so support projects and activities aimed at generating new scientific and technological knowledge -in basic and applied topics- developed by researchers working for non-profit public and private institutions in the country. It obtains its funding from National Treasury funds, Inter-American Development Bank (IDB) loans and cooperation agreements with national and international agencies or institutions. FONCyT handles promotion and funding instruments to support different kinds of research projects.

In all cases, three-year grants are awarded through open competition. The instruments could be any of the following: (i) Scientific and Technological Research Projects; (ii) Targeted Scientific and Technological Projects; (iii) Research and Development Projects; (iv) Equipment Modernization Projects; (v) Strategic Area Projects; (vi) Scientific Meetings; and (vii) Qualification Certificates. Among others, FONCyT finances research in the field of Medical and Social Sciences related to Health. Considering only the Scientific and Technological projects in the period 1998-2004, a total of 2,587 grants were awarded, out of which approximately 16 % were in the field of Medical Sciences.

Through the **Argentine Technological Fund (*Fondo Tecnológico Argentino* - FONTAR),** the Agency promotes the possibility of improving public sector productivity. In this regard, FONTAR manages public and private, and both national and international resources (contributions from the National Treasury, credit lines from public banks, funds from multilateral organizations, etc.) to promote –through open competition- different innovative initiatives for upgrading the companies' technological level and fostering their competitiveness. For that purpose it: i) promotes and funds project implementation; ii) technically, economically and financially evaluates such projects; iii) technically assists in their development; and iv) supervises the performance of subsidized projects, etc.

3.3. National Ministry of Health

As already mentioned, the Argentine health system has two main features: decentralization in the allocation and management of provincial resources, and fragmentation of social security and private insurance mechanisms. Decentralization brings about dispersion in decision making on the health spending targets and only 16% of disbursements are made by the National Ministry (Maceira, 2008). This includes public research in the field of health funded by the national health authority. Within this framework, the Ministry of Health has ordinary lines of research financed with local funds or international loans and carries out sporadic research work linked not only to health priorities but also to emergency issues.

The first group includes the **National Administration of Health Institutes and Laboratories (*Administración Nacional de Laboratorios e Institutos de Salud* -ANLIS).** It operates as a decentralized public entity with the purpose of carrying out and coordinating actions to prevent infectious diseases, focusing mainly on research. The main purpose of this institution is to set up stronger bonds between scientific and technical policies and health actions within public health policies.

The ***Salud Investiga*** **National Commission (Research by Health Ministry)** was created in March 2002 by Resolution No. 170/2002 of the National Ministry of Health, within the Under-secretariat for Health Relations and Research. It is in charge of managing he annual fellowship Program "Ramón Carrillo – Arturo Oñativia", with National Treasury funding. The purpose of the Commission is to reinforce the Ministry of Health's activities for prioritizing research and interventions in the field of health to reduce the gap between production - utilization of scientific evidence in clinical and health decision-making, political action and opinion shaping. Moreover, the Commission promotes and carries out collaborative multi-center studies on public health problems, according to the priority topics approved by Resolution No. 1221/2004.

Finally, the Ministry of Health implements programs and projects using external funding provided by different international organizations and agencies. They normally have lines of credit to support research in topics related to each Program. With the purpose of linking their activities with impact indicators, Ministerial Resolution No. 905/2001 created the **Unit for the International Financing of Health (*Unidad de Financiamiento Internacional de Salud* - UFI-S)**, placed directly under the Minister of Health. This unit coordinates the management of financial-technical cooperation programs and projects at the Ministry, controlling the fulfillment of commitments and assessing the opportunity and timeliness of developing new undertakings. UFI-S provides technical assistance in issues such as networking, project programming and evaluation, and in several other fields: investments in architecture and equipment; administrative, financial and budgetary innovations, among others. There follow some of the main programs of the Ministry for 2008: Project on Essential Functions and Prioritized Programs in Public Health; Mother and Child Program, *Nacer* Plan (Maternal and Child Plan); *Remediar* Program (for providing medication to low income groups); Health Surveillance and Disease Control Program; and Strengthening of the Strategy for Primary Health Care, among others.

4. Sources of Information and Methodology

The analysis of information on Argentine national government funds called for the consolidation of a database to allow the detection and comparison of trends in flows targeted to research in the field of health among the different institutions mentioned above. The database built for the lines of research stemming from funds allocated to open competitions is grounded on the database used by Maceira and Peralta Alcat (2008), which was then reclassified by research topics, adding FONTAR resources. This is supplemented with

administrative information provided by ANLIS and taken from the estimates on incidence of research work on the Ministry of Health's budget delivery to that agency.

Each of the agencies provided information on grants, fellowships and funds allocated throughout the period 1967-2006 for Medical Sciences and Social Sciences related to health topics. Information provided by the institutions was homogenized according to a series of criteria. These criteria are, on the one hand, since the institutions have different financing instruments as to fellowship and grant duration, an annual data base was set up. Secondly, a classification into 27 potential categories was established for the different fellowships and grants regarding all research work financed by the agencies, based on the criteria set forth in the previous chapter on the Methodological Framework. Finally, consideration was given to research work funded and ongoing in the period 2002-2006.

Each agency has a different financing mechanism for its research work. The National Commission *Salud Investiga* uses one-year periods for its fellowships while grants awarded by FONCYT average around three years. Therefore, and in order to consider evolution throughout time, funds were annualized, and for *Salud Investiga* we respected an annual rate, while in the case of FONCYT each observation was prorated between three terms.

On the other hand, CONICET researchers receive a monthly stipend, depending on their category (Assistant, Deputy, Independent, Chief or Senior Researcher), their *years of service* and the *province* in which they carry out their research work. As from their year of entry into the agency and their current category, the hypothesis of promotion every five years was considered, allocating an average stipend to each category per period. In the case of fellows from the same agency, the database includes the starting and completion date of each fellowship, so the expansion was carried out on the basis of these time frames. Fellows also receive monthly stipends allocated according to the following categories: Mixed PhD Fellowship, Internal PhD Co-financed Fellowship, Internal PhD Fellowship, Internal post-PhD Fellowship, Postgraduate Type I and Postgraduate Type II.

At the same time, CONICET makes periodic calls for project submission, the latest calls being those of 1998, 1999 and 2005. In this case, expansions of observations were made for the periods matching each payment installment which, just like FONCyT, have an average of three years' duration. Since the amounts allocated are not disbursed all at once but in annual installments, these parameters were used to annualize compensation for research work.

In the case of FONTAR, the considered baseline has three big categories: Grants, Fiscal Credit Programs and Regional Credits, with a different duration in each case. While Grants have a maximum duration of 12 months, Fiscal and Regional Credits have a maximum duration of 36 months. In the two latter cases, the research team used the same annual re-distribution criteria.

Likewise, variables were built on the geographical location of funds by province, gender and age of researcher. Jurisdictional location is a variable related to the place at which the fund awardee carries out the research work, whilst the sex of the chief researcher defines gender breakdown. The latter excludes FONTAR since grants in this case are assigned to legal persons (companies). It was only possible to apply breakdown by age in CONICET and *Salud Investiga*. Finally, an additional classification criteria was based on the nature of the recipient institutions of the grant (Private Agency, Public Agency, Public Hospital, Private Hospital or Clinic and Universities), only systematized in the case of CONICET.

The final outcome from applying the above-described criteria is a database of 5,361 entries, out of which 756 are for *Salud Investiga*, 3,839 for CONICET, 587 for FONCYT and 177 for FONTAR. A descriptive and econometric analysis was carried out on this basis. A summary of database information appears in Table 2.

Finally, and in order to carry out a comparative analysis among the different countries included in this volume, the amounts (stated originally in current Argentine pesos) of each of the entries were then converted into dollars adjusted for purchasing power parity (PPP US$). For this purpose, the International Monetary Fund (IMF, 2008) PPP index in US$ for 2002-2006 was used.

Table 2. Database Contents

Characteristics	Institution					
	Salud Investiga	FONCyT	FONTAR	CONICET		
				Calls	Researchers	Scholars
Number of Observations	756	587	177	988	2229	624
Period	2002-2006	2002-2005	2002-2006	1998, 1999 and 2005	2002-2006	2002-2006
Year concerns to:	Amount Receipt Year	Amount Receipt Year	Amount Receipt Year	Amount Receipt Year	Admission in Conicet Year	Admission in Conicet Year
Category	Social Sciences	Medical Sciences and Social Sciences	Medical Sciences	Medical Sciences and Social Sciences	Medical Sciences and Social Sciences	Medical Sciences and Social Sciences
Workplace	Yes	-	-	Yes	Yes	Yes
Province	Yes	Yes	Yes	Yes	Yes	Yes
Monto (U$S PPP)	Grant	Benefit	Benefit	Benefit	Gross Stipend	Average Gross Stipend
Research Title	Yes	Yes	Yes	Yes	Yes	Yes
Profession	-	Yes	-	-	-	-
Age	Yes	Yes	-	-	-	-
Sex	Yes	Yes	-	Yes	Yes	Yes
Researcher Category	-	-	-	Yes	Yes	Yes

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

Once the database was obtained on the basis of the above-described criteria, each of the projects was classified according to the criteria agreed upon by the research team as set forth in the previous chapter. Such classification combines, on the one hand, the nature of the research work (biomedicine, clinical medicine and public health) and, on the other hand, research objectives broken down into (i) socioeconomic and health conditions, (ii) nature of the problem, in terms of communicable or non communicable diseases, those related to nutrition and food intake, violence or accidents; and (iii) activities involved, which include the categories of research in health policies, systems and services; technological research and development; basic sciences; and traditional medicine. The matrix, combining methodologies and objectives, gave rise to 27 combinations. A detailed description of each is included in the methodology chapter of this volume.

5. Outcomes

This section firstly shows the evolution of ANLIS and its institutes and then addresses descriptive statistics arising from the database which includes CONICET, FONCYT, FONTAR and *Salud Investiga.*

5.1. National Administration of Health Institutes and Laboratorios (*Administración Nacional de Laboratorios e Institutos de Salud* - ANLIS)

ANLIS is a decentralized institution placed within the structure of the Secretariat of Policies and Regulation, National Ministry of Health. Through direct research actions of its different institutions, or through training and consulting projects, ANLIS participates in cooperation activities with the National Ministry of Health, other public sector institutions, civil society organizations, international agencies and scientific-technological bodies.

Currently, it has 11 institutes and centers located throughout the country. Among them, is the National Center for Biological Quality Control (*Centro Nacional de Control de Calidad de Biológicos*) whose main responsibility is related to controlling the quality of vaccines, immunotherapeutic substances and reagents used in prevention and diagnosis; the National Center on Nutritional Research (*Centro Nacional de Investigaciones Nutricionales*) which does research on the causes for nutrition-related regional and idiosyncratic diseases; and the National Institute of Acute Infectious Diseases (*Instituto Nacional de Enfermedades Infecciosas Agudas)*, which develops and promotes knowledge on the biological characteristics of virus and bacteria as etiological agents in human pathologies, their means of transmission and their diagnosis. The following Table shows the Executing Units (institutes and centers) and the Program each one is implementing. Based on budget delivery for 2008, the Table also includes the estimated incidence of investment of each Executing Unit in Science and Technology, based on information provided by ANLIS. These values were applied to budget delivery for 2002-2006 and converted into PPP dollars. The last two columns reflect prevailing research methodologies at each institute and the main topic in the light of the category matrix.

ANLIS allocated around 5% of its 2006 total budget to research, which entails 1.5 million PPP dollars. This percentage, however, reflects a great dispersion among institutions, reaching a maximum of 39% in the Medical Genetics and Nutritional Research Institutes, and no incidence at all in the case of the *Centro Nacional de Red de Laboratorios* (National Center of Laboratory Networks), or the *Instituto Maiztegui de Enfermedades Virales Humanas* (Institute for Viral Diseases). Table 3 shows the evolution in health-related research for the 2002-2006 five-year period, by institution and total number.

It is thus inferred that the evolution of public investment in research within this institution has increased constantly in the five-year period under analysis (17% on average), totaling US$ 843982 PPP in 2002 and reaching a maximum of US$ 1568108 PPP in 2006. Likewise, it must be noted that the institution has a marked trend to favor programs targeted to Biomedical and Clinical research methodologies, through two Executing Units (INE and CNIN) that carry out Public Health activities.

Bringing together all ANLIS institutes and centers based on the prevailing research topic, it was noted that in 2006, basic research topics accounted for approximately 41% of allocated resources, while public health and clinical research accounted for 37% and 22%, respectively.

Table 3. ANLIS: Executing Units, Delivered Budgets assigned to Research, 2002-2006, in PPP US$

Execution Unit	Program	Funds assigned to Research, USD PPP							Research Category	
		Research % 2008	ACRONYM	2002	2003	2004	2005	2006	Methodology	Topic
National Institute of Acute Infectious Diseases	Research, Teaching and Services on Bacterial, Fungal, Parasitic and Viroses Infections	15,72%	INEI	304.413	356.814	371.610	460.727	565.596	Biomedical	Communicable illnesses
National Center on Nutritional Research	Research and Diagnosis of Nutritional Risk Factors	38,99%	CNIN	273.869	321.012	334.324	414.498	508.845	Public Health	Nutrition
National Institute of Parasitology Dr. Mario Fatala Chabán	Research, Teaching and Services on Parasitic Diseases	9,20%	INP	127.999	150.032	156.253	193.725	237.820	Clinical	Policy, Systems and Services
National Institute of Epidemiology Dr. J.H. Jara	Training and Epidemiological and Nosocomial Infections Services	4,44%	INE	39.605	46.423	48.348	59.942	73.586	Public Health	Policy, Systems and Services
National Center for Diagnosis and Research on Endemic-Epidemies	Research, Development and Services on Endemic-Epidemies	21,66%	CENDIE	29.444	34.512	35.943	44.562	54.706	Clinical	Communicable illnesses
National Institute of Respiratory Diseases Dr. E. Coni	Control of Tuberculosis and Other Respiratory Diseases	2,94%	INER	29.226	34.257	35.678	44.233	54.302	Clinical	Communicable illnesses
National Center for Medical Genetics	Training and Attention of Genetic Risk Factors	39,09%	CNGM	22.961	26.913	28.029	34.751	42.661	Biomedical	Non-communicable illnesses
National Center for Biological Quality Control	Quality Control of Biologicals	1,17%	CNCCB	13.071	15.321	15.956	19.782	24.285	Biomedical	Basic Research
National Institute of Biological Production	Development and Production of Biologicals	0,15%	INPB	2.227	2.610	2.718	3.370	4.137	Biomedical	Non-communicable illnesses
National Institute of Human Viral Diseases Dr. J.Maiztegui	Research, Teaching and Services on Human Viroses	0,01%	INEVH	1.169	1.370	1.427	1.769	2.171	Clinical	Communicable illnesses
National Center of Laboratory Networks	Coordination and Support to the Laboratories Network	0,00%	CNRL	0	0	0	0	0	Biomedical	Policy, Systems and Services
TOTAL				**843.983**	**989.264**	**1.030.286**	**1.277.359**	**1.568.109**		

Source: Based on information provided by ANLIS.

5.2. Analysis of government funds available for open competition to carry out health research

This section reflects the results of two big groups of variables. The first group of variables identifies, for the aggregate of institutions and for each one individually, the general characteristics of the recipients of national government funds for health research, by age, gender and by provincial and regional concentration for the 2002-2006 five-year period. The second group of variables looks into financing policies, criteria for allocation of funds to projects by topic and, therefore, the outcomes of prioritization strategies, at the aggregate level as well as within each of the four agencies of this study[13].

5.2.1. General aspects

Research by gender

Table 4 reflects a larger female share in health research financed with government funds, in a ratio of 59.22% to 40.78%. Despite the general behaviour identified in the study, there are differences between institutions. While *Salud Investiga* has a 64% of female participation, FONCyT equitably distributes funds between both genders, and at CONICET, the institution with the greatest number of researchers (3841) only 40.48% are men.

Table 4. Researchers by Institution and Sex

Institution	Relation	sex		Total
		Male	Female	
Salud Inv.	Number	270	487	757
	%	35.67	64.33	100.00
Conicet	Number	1,555	2,286	3,841
	%	40.48	59.52	100.00
Foncyt	Number	290	298	588
	%	49.32	50.68	100.00
Total	Number	2,115	3,071	5,186
	%	40.78	59.22	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

Social Sciences' contribution to health research

According to the above-mentioned data, information provided by public research agencies can be included in two big categories: Medical Sciences and Social Sciences. The latter takes into account all research work carried out by sociologists, economists, anthropologists, etc. on health topics. Considering the three agencies (and four institutions), Table 5 shows that *Salud Investiga* is the one that mainly funds research within the framework of Social Sciences, through 757 projects. On the other hand, FONTAR, given its nature, almost exclusively finances projects related to Medical Science development. Not much significance is attached to Social Sciences at CONICET and FONCyT, with a 3.8% and 6.8% of health projects, respectively.

13 The analysis unit in this study is "research in health" and not "innovations in health". It is worth highlighting that R&D is only one of the links of innovation. In order to delve deeper into the innovation process, other aspects should be taken into consideration such as patent-protected technologies, modifications in human capital productivity (e.g. training, consultancies, etc.) and essentially the introduction of capital goods in the sector's "productive process", which is no minor aspect in the field of health.

Table 5. Thematic categories by institution

Institution	Relation	Cathegory		Total
		Social Sciences	Medical Sciences	
Salud Inv.	Number	757	0	757
	%	100,00	0,00	100,00
Conicet	Number	146	3,695	3,841
	%	3,80	96,20	100,00
Foncyt	Number	40	548	588
	%	6,80	93,20	100,00
Fontar	Number	0	178	178
	%	0,00	100,00	100,00
Total	Number	943	4,421	5,364
	%	17,58	82,42	100,00

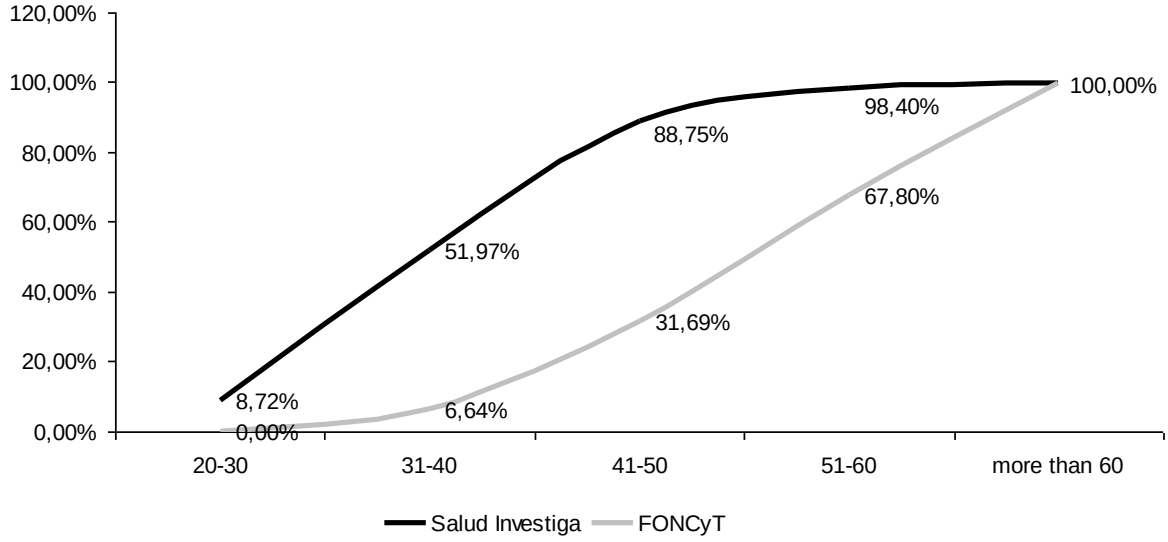
Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

Age group distribution of researchers

The study was only able to compare two institutions as regards fund allocation to health research according to the age of the beneficiary: *Salud Investiga* and FONCyT. As can be noted in Figure 4, *Salud Investiga* is an institution comparatively biased to younger researchers, a fact that is duly explained in its institutional strategy. Approximately 10% of *Salud Investiga* fellows are under 30 and, if we also consider the group of researchers up to 40, that percentage surpasses half of the resources committed by the institution (51.92%). Meanwhile, FONCyT is different, with no participation at all of researchers up to thirty years old and only 6.63% up to forty. Those over 50, have a 50% share in allocable funds. At *Salud Investiga* researchers under 50 account for 88% of the funds and for only 32% at FONCyT.

Although there is no information to quantify and determine the age profile at CONICET, it probably has a greater dispersion of fund allocation, given its organization and structure. This is so because it has a sustained system of fellowships and has a researcher career which provides funding to scientific cadres with long-standing academic careers and experience.

Figure 4. Cumulative Age Density by Institution



Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

Provincial and regional concentration patterns in fund allocation

Table 6 shows, by province and in descendant order, the participation of each jurisdiction in the implementation of government-funded health research projects in Argentina. The table includes information on the four allocable public funds. The first three columns show the number of fellowships and grants received by jurisdiction, their weight in percentage points over the total and cumulative amounts. The last three columns reflect each jurisdiction's share in the country's total number of inhabitants, the cumulative figure and an indicator of the number of health research projects for every 10 thousand inhabitants in each province.

It can be noted that 73.93% of fellowships and grants awarded by all four institutions are for Buenos Aires City and Buenos Aires Province, where 47.2% of the country's population lives. Should we add Córdoba, Sante Fe and Mendoza, this percentage amounts to 94.79% surpassing the population share of these jurisdictions in the country total (70% of the population).

Despite the above, the incidence of projects by province does not follow the same pattern. Although in the capital city of the country, financing density is higher than the national average (10.98 projects per ten thousand inhabitants), the provinces of Cordoba, Rio Negro and Mendoza have a ratio of over 1 project per ten thousand inhabitants, relegating Santa Fe to the fifth place and Buenos Aires Province to the eighth place. The minimum rates were found in Santiago del Estero (0.02), La Rioja (0.03), Catamarca (0.05) and San Juan (0.08). Finally, La Pampa as well as Santa Cruz and Tierra del Fuego have no health research projects financed by the national government.

Table 6. Fellowships and Grants by Province

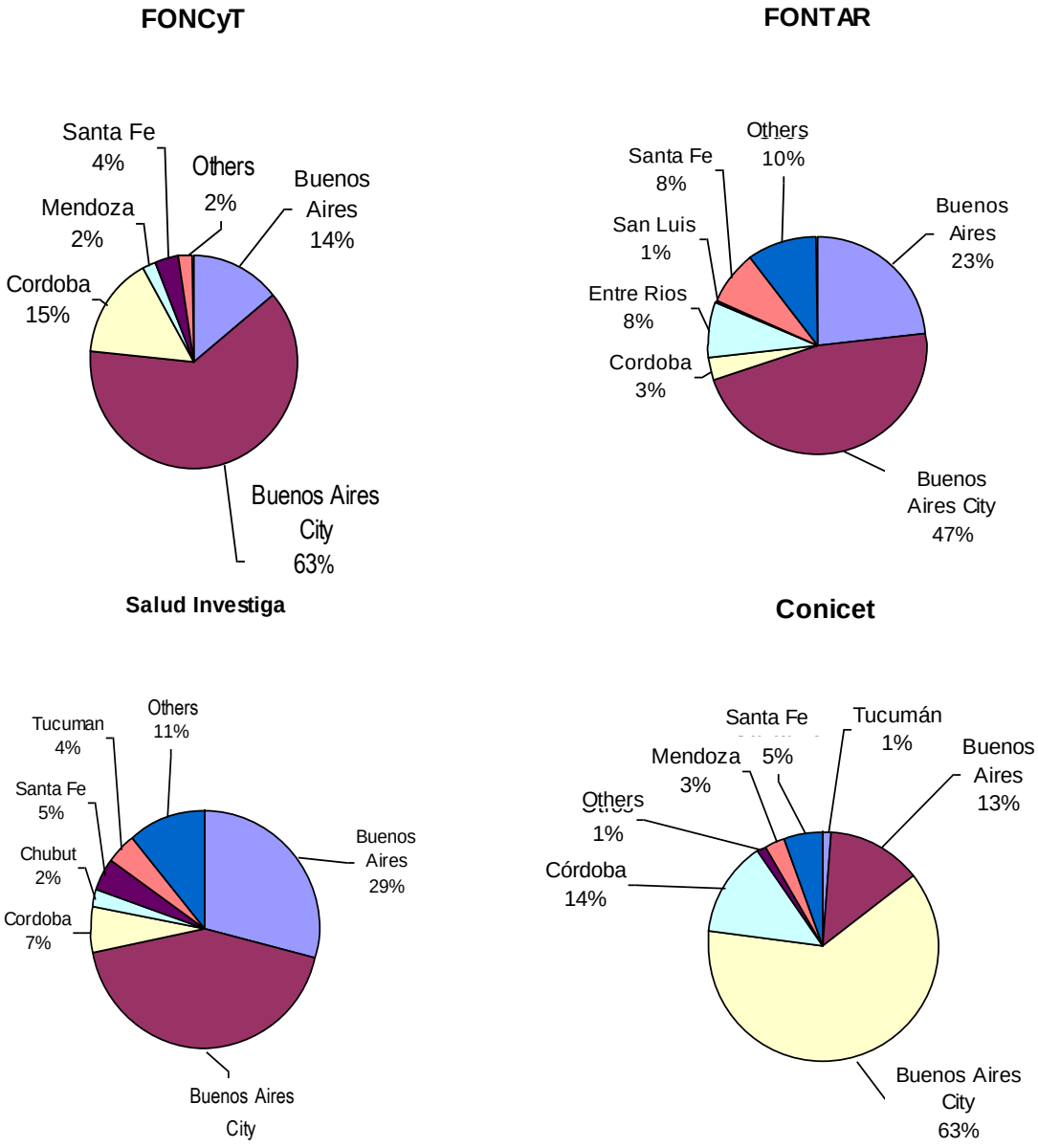
Province	Number of Fellowships and Grants	Participation over the Total (%)	Cumulative Participation (%)	Population - Participation over the Total (%)	Cumulative Participation (%)	Researchers per 10000 Inhabitants
Buenos Aires City	3049	58,23%	58,23%	7,9%	7,9%	10,98
Buenos Aires	822	15,70%	73,93%	39,3%	47,2%	0,59
Cordoba	643	12,28%	86,21%	8,7%	55,9%	2,10
Santa Fe	270	5,16%	91,37%	8,5%	64,5%	0,90
Mendoza	179	3,42%	94,79%	4,5%	69,0%	1,13
Tucuman	93	1,78%	96,56%	3,8%	72,8%	0,69
Salta	29	0,55%	97,12%	3,1%	75,8%	0,27
Chubut	25	0,48%	97,59%	1,2%	77,0%	0,60
San Luis	19	0,36%	97,96%	1,0%	78,1%	0,52
Chaco	17	0,32%	98,28%	2,8%	80,9%	0,17
Entre Rios	17	0,32%	98,61%	3,3%	84,2%	0,15
Misiones	16	0,31%	98,91%	2,7%	86,9%	0,17
Corrientes	14	0,27%	99,18%	2,6%	89,6%	0,15
Jujuy	11	0,21%	99,39%	1,7%	91,3%	0,18
Rio Negro	9	0,17%	99,56%	0,2%	91,4%	1,67
Neuquen	8	0,15%	99,71%	1,3%	92,8%	0,17
Formosa	5	0,10%	99,81%	1,4%	94,2%	0,10
San Juan	5	0,10%	99,90%	1,8%	95,9%	0,08
Catamarca	2	0,04%	99,94%	1,0%	96,9%	0,06
Santiago del Estero	2	0,04%	99,98%	2,3%	99,2%	0,02
La Rioja	1	0,02%	100,00%	0,8%	100,0%	0,03
Total	**5.236**	**100%**		**100%**		

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

5.2.2. Fund allocation by institution

In order to identify each institution's policy in the geographical allocation of resources, Figure 5 shows each province's share in the total of fellowships and grants awarded in 2002-2006. At the same time, Table 6 reflects the presence of each institution by province and average expenditure in PPP dollars per 10 thousand inhabitants for the year 2006.

Figure 5. Share in Fellowship and Grant Allocation by Institution



Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

From this analysis, it can be noted that *Salud Investiga* is a relatively more federal institution as far as resource allocation is concerned, and it awards grants in 21 of the 24 Argentine jurisdictions (23 provinces and the Buenos Aires Federal District). Furthermore, this institution has a lower relative share in Buenos Aires city.

The table shows certain dispersion among agencies. CONICET is present in 14 jurisdictions while FONCyT and FONTAR provide grants in 9 and 12 provinces, respectively. Clearly CONICET leads the average disbursement by province, with 9,854 PPP US$ per ten thousand inhabitants, with an approximate ratio of 4:1 compared to FONCyT, its immediate

follower. While *Salud Investiga* and FONTAR have the lowest rate of fund allocation for every 10 thousand inhabitants in Buenos Aires city (with 11,015 and 4,292 dollars, respectively), CONICET has its maximum in Buenos Aires city (44,294 dollars per 10 thousand inhabitants). FONCyT's maximum grant allocation takes place in the Federal Capital City and also in Cordoba (16,157 dollars).

Likewise, both FONCyT and FONTAR allocate a minimum amount to San Luis (113 and 587 dollars per 10 thousand inhabitants), while *Salud Investiga* and CONICET allocate the minimum amounts to Corrientes (144 dollars) and San Juan (55 dollars) provinces, respectively.

Table 7. Allocation of Funds by Province and Agency

Province	Salud Investiga		Conicet		FONCyT		FONTAR	
	Participation on the Total ($)	U$S PPP/10000 Inhab.	Participation on the Total ($)	U$S PPP/10000 Inhab.	Participation on the Total ($)	U$S PPP/10000 Inhab.	Participation on the Total ($)	U$S PPP/10000 Inhab.
Buenos Aires City	42,32%	11.015,23	65,33%	44.294,42	67,57%	15.184,06	53,11%	4.292,34
Cordoba	6,57%	2.217,00	12,01%	36.702,03	15,95%	16.156,90	3,25%	1.185,46
Buenos Aires	29,55%	3.167,55	11,98%	40.445,86	12,35%	13.826,67	19,59%	7.884,29
Santa Fe	4,71%	1.622,85	4,93%	15.414,58	2,48%	2.571,14	8,42%	3.136,46
Mendoza	1,57%	1.028,58	3,69%	21.897,33	0,76%	1.498,33	1,35%	951,95
Tucuman	3,84%	2.971,89	0,90%	6.331,95	0,27%	633,57	1,83%	1.526,99
Salta	1,35%	1.299,05	0,44%	3.820,75	0,00%	0,00	1,83%	1.898,05
Corrientes	0,13%	144,01	0,20%	2.001,63	0,00%	0,00	0,00%	0,00
Rio Negro	0,50%	9.532,58	0,17%	29.946,77	0,00%	0,00	0,00%	0,00
Chubut	2,01%	5.022,38	0,17%	3.793,31	0,54%	4.087,36	0,00%	0,00
Chaco	1,07%	1.124,34	0,14%	1.324,49	0,00%	0,00	1,57%	1.777,42
San Luis	1,09%	3.061,52	0,03%	829,57	0,01%	113,63	0,19%	587,68
Jujuy	1,25%	2.118,44	0,01%	84,69	0,00%	0	0,00%	0
San Juan	0,42%	708,93	0,00%	55,87	0,00%	0	0,00%	0
Misiones	1,17%	1.257,07	0,00%	0	0,05%	168,52	1,45%	1.677,29
Entre Rios	0,39%	346,01	0,00	0	0,00%	0,00	6,37%	6.143,21
Neuquen	0,71%	1.557,55	0,00%	0	0,00%	0	1,04%	2.446,21
Catamarca	0,22%	686,12	0,00%	0	0,00%	0,00	0,00%	0,00
La Rioja	0,12%	420,55	0,00%	0	0,00%	0,00	0,00%	0,00
Santiago del Estero	0,25%	321,10	0,00%	0	0,00%	0,00	0,00%	0,00
Formosa	0,76%	1.613,31	0,00%	0	0,00%	0,00	0,00%	0,00
Total	**100%**	**2439,81**	**100%**	**9854,44**	**100%**	**2574,84**	**100%**	**1106,70**

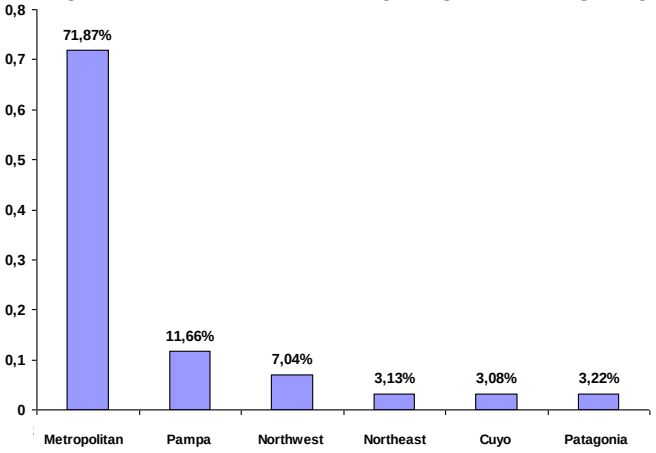
Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

In line with the above, if we take a look at the amounts awarded to research (expressed in PPP dollars) for 2002-2006, by region, results are not significantly different. For all four agencies, the Metropolitan and Pampa Regions[14] account for 83.53% in *Salud Investiga*, 94.25% in CONICET, 98.36% in FONCyT and 90.74% in FONTAR.

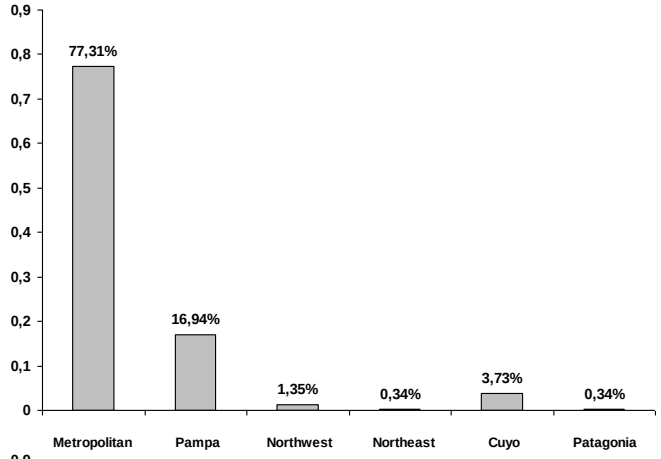
[14] The following regions were taken into account: Metropolitan (Buenos Aires City and Buenos Aires Province), Pampa (Córdoba, Entre Ríos, La Pampa y Santa Fe), Northwest -NOA (Catamarca, Jujuy, la Rioja, Salta, Santiago del Estero & Tucumán), Northeast - NEA (Chaco, Corrientes, Formosa & Misiones), Cuyo (Mendoza, San Juan & San Luis) and Patagonia (Chubut, Neuquén, Río Negro, Santa Cruz & Tierra del Fuego).

Figure 6. Fund Allocation by Region and Agency. Share in the total. 2002-2006

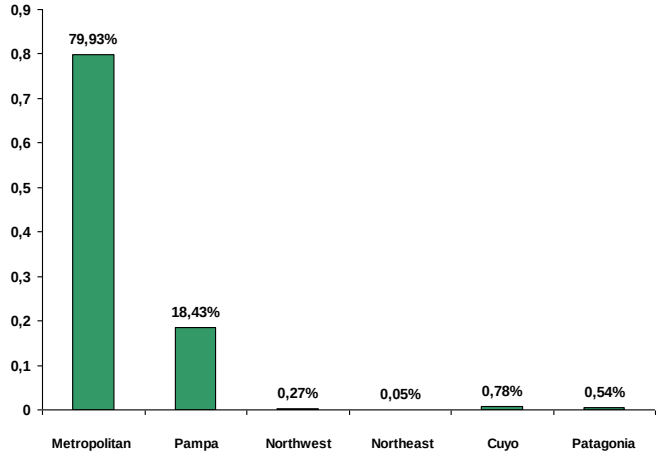
Salud Investiga



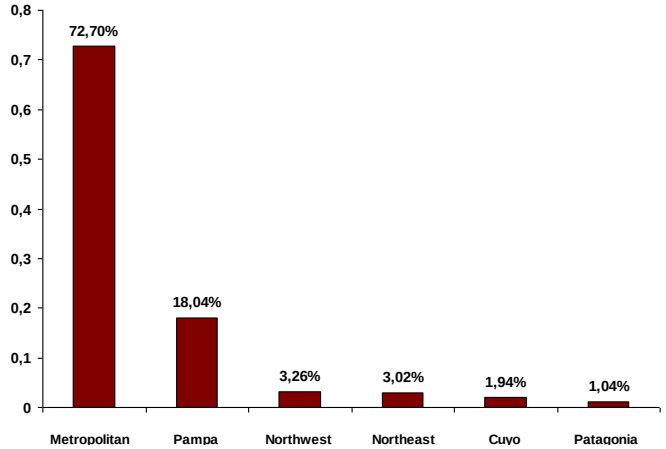
CONICET



FONCyT



FONTAR

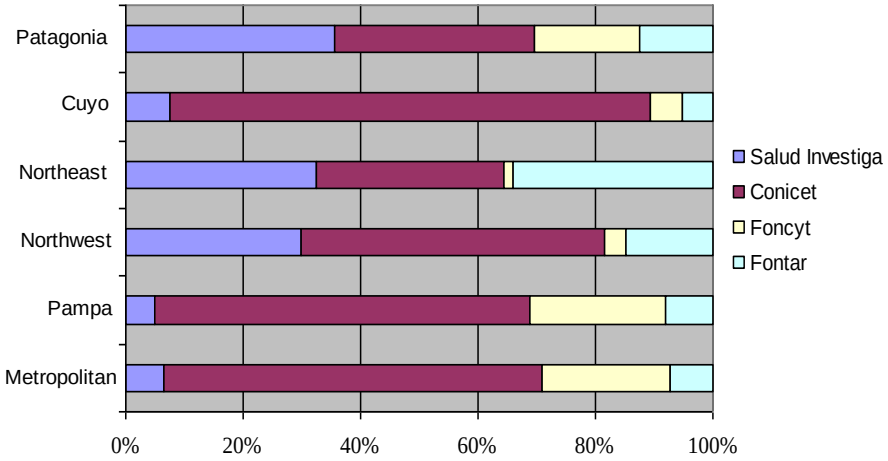


Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

At Salud Investiga, 71.87% of funds were allocated to the Metropolitan region and 11.66% to the Pampa region. Regarding the other three agencies, 77.31% (CONICET), 79.93% (FONCyT) and 72.70% (FONTAR) was awarded to the Metropolitan area. Northeast Argentina (NEA), Cuyo and Patagonia are the regions that receive the lowest allocations in all four agencies. All three regions together account for 9.43% at *Salud Investiga*, 4.41% at CONICET, 1.37% at FONCyT and 6% at FONTAR.

Finally, Figure 7 shows the percentage share of each institution in the six regions taken into account for 2002-2006. The presence of CONICET is preponderant although with a lower relative importance in Patagonia and a greater presence in Cuyo. On the other hand, FONTAR has a greater incidence in Northeast than in Northwest Argentina, while FONCyT is relatively important in the central regions (Pampa and Buenos Aires city). *Salud Investiga*, although with a greater overall presence by project, has a smaller percentage share in research funding. Therefore, its influence in the Pampa region, Metropolitan Area and Cuyo is relatively lower than that of other institutions, playing a more important role in NEA, NOA and Patagonia.

Figure 7. Institutional share by Region, in % of Regional Total



Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

Idiosyncrasy bias in regional research

Particularly in a country with a big gap in income distribution and with such diverse health profiles as Argentina, it is reasonable to find local idiosyncrasy biases (regional/provincial) concerning needs in health research. A certain alignment could be expected between the place of residence of the funded project and its nature, according to the need for or importance of such project within a given geographical context. Nonetheless, an analysis by region and topic shows that, in most cases, the Metropolitan region and especially Buenos Aires City attract most investments in health research as appears in Table 8. The only exceptions encountered are the lines of work of Biomedicine-Nutrition and Biomedicine-Violence, where the regions with the greatest level of fund allocation are the Pampa and Northwest Argentina-NOA, with percentages amounting to 52.94% and 100%, respectively.

Table 8. Research Topics by Region - Maximum and Minimum Levels

Research	Reference	Maximum (%)	Minimum (%)
Biomedical	Region	Metropolitan	Patagonia
	%	74,02	0,17
Clinical	Region	Metropolitan	Cuyo
	%	73,3	1,57
Public Health	Region	Metropolitan	Northeast
	%	73,91	2,01

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

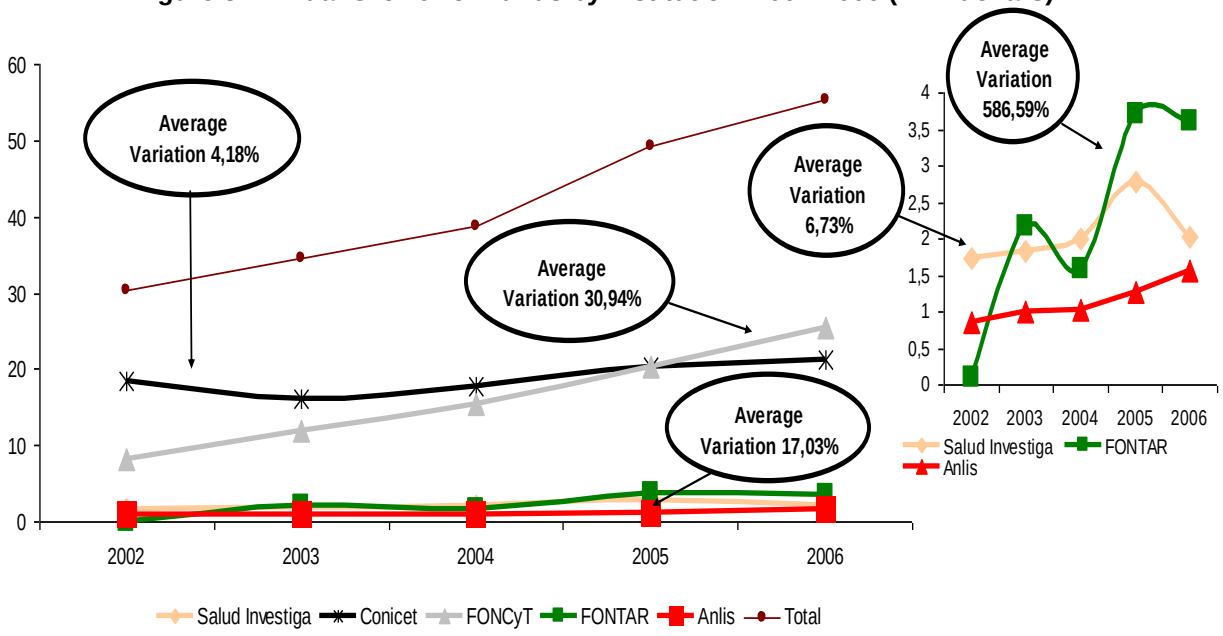
6. Flow of Funds and Research Topics

6.1. Evolution of National Government Funds allocated to Health Research

Figure 8 hereafter shows the evolution of government funds allocated to health research for the five-year period under consideration, stated in PPP dollars for all four institutions. The figure also includes resources allocated by ANLIS in its programs' research components.

The five agencies reveal a growing trend throughout time. There was an increase of 82.9% in health targeted funds between both ends of the five-year period. There are, however, significant differences between financing mechanisms. CONICET and *Salud Investiga* have an annual growth rate of 4.18% and 6.73%, and the annual average variation of FONCyT and FONTAR was 30.94% and 586.59%, respectively. In 2005 FONCyT displaced CONICET as the first source of grants for research in the Argentine health sector. On the other hand, ANLIS increased by 86% the ministerial funds allocated to research, coming close to *Salud Investiga* in 2006.

Figure 8. Annual Growth of Funds by Institution. 2002-2006 (PPP dollars)[15]



Source: Based on information provided by ANPCyT, CONICET, ANLIS and *Salud Investiga.*

[15] Given the relative size of *Salud Investiga*, ANLIS and FONTAR funds, we decided to enhance the illustration, separate it from the other two institutions and present it on the right hand side of the graph, using a different scale.

6.2. Financed Topics

Based on information available, within the total amount of allocated funds, the research team was able to establish health prioritization criteria for each institution separately and for the National Innovation System as a whole. Anyhow, this vision is partial since there is no information on the total amount of funds to be allocated through open competition and therefore on the project offer based on which the funding institutions carried out their selection.

The fields of research, as already mentioned in the second part hereof, were classified into 27 potential categories which cut across three research areas and nine topics. In Tables 1 to 5 attached hereto, project allocations broken down by institution were identified by category and geographical region.

Table 9 considers the amount of projects implemented with public institution funding in Argentina for the 2002-2006 five-year period and their correlation in PPP dollars. As illustrated in the above figure, this Table includes funds allocable by open competition in all four institutions under consideration, the resources from the National Administration of Health Institutes and Laboratories (*Administración Nacional de Laboratorios e Institutos de Salud*). Each cell shows the total funding and number of projects (between brackets) for each category. The same breakdown by year can be found in Table 8, attached hereto.

The period under analysis involved 205.6 million PPP dollars in health research, distributed among 5,411 projects (fellowships, institutional or personal grants, budgeted funds allocated to state-owned research centers). Related projects were not identified in only three categories.

Table 9. Matrix of Research Projects in Argentina in the 2002-2006 Total. PPP Dollars

Categories Objective	Research Methodology			
	Biomedical	**Clinical**	**Public Heatlh**	**TOTAL**
Social, Economic and Cultural	-	484475,8 (17)	1064273,76 (54)	**1548749,56 (71)**
Communicable Illnesses	18927588,7 (406)	4015940,46 (106)	650011 (28)	**23593540,2 (540)**
Non-Communicable Illnesses	73544573,03 (2040)	8942603,91 (322)	1663808,23 (74)	**84150985,2 (2436)**
Nutrition and Environment	1214129,53 (52)	1329864,66 (67)	2491685,14 (34)	**5035679,33 (153)**
Violence and Accidents	17000 (1)	170946,14 (11)	227166,7 (26)	**415112,84 (39)**
Health Policies, Systems and Services Research	-	1295125,46 (42)	7560239,16 (312)	**8855364,62 (354)**
Technological R&D	9538996,34 (112)	2140484,07 (29)	2679556,1 (44)	**14359036,5 (185)**
Traditional Medicine	859738,17 (37)	-	5400 (1)	**865138,17 (38)**
Basic Science	65940107,7 (1584)	801897,3 (10)	3541,5 (2)	**66745546,5 (1595)**
TOTAL	**170042133 (4232)**	**19181337,8 (604)**	**16345681,59 (575)**	**205569152,39 5411**

Source: Own development based on Conicet, ANPCyT, *Salud Investiga* and ANLIS.

Note: Between brackets is the number of projects per category

Most of the projects (78%) focus on biomedical research, with a prevalence of non communicable diseases and basic sciences. The former research field, with 2,040 projects, includes 73.5 million dollars for the five-year period, while the latter is allocated 65.9 million through 1,584 projects.

As far as their importance in monetary terms is concerned, biomedical research in communicable diseases is ranked third (19 million and 406 projects) followed by technological R&D (9.5 million and 112 initiatives).

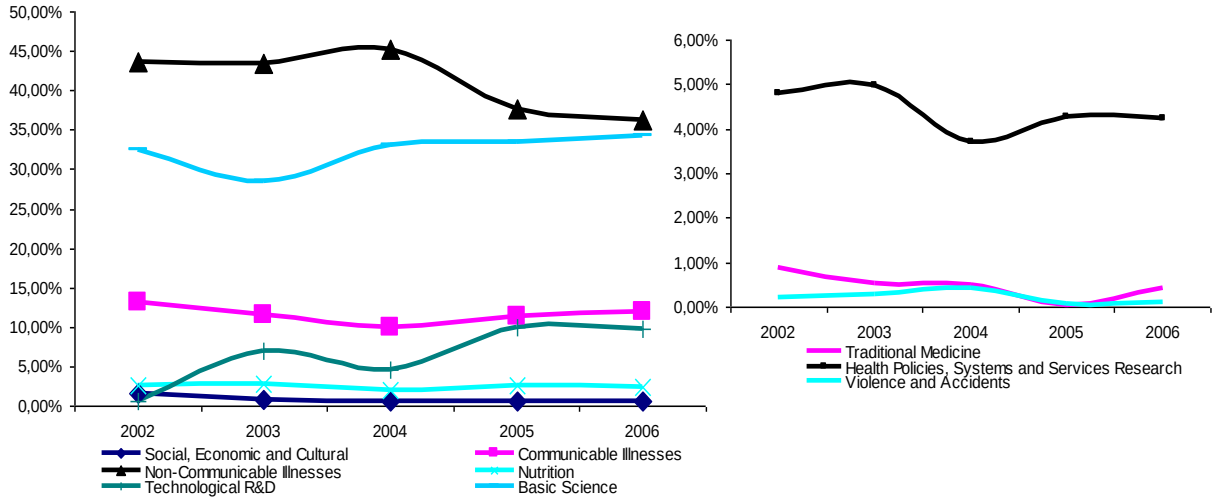
The remaining 22% of government funding of research is equally distributed between clinical research and public health research, with 604 and 575 projects, respectively. In terms of clinical research, once again non communicable diseases account for the greatest amount, around nine million PPP dollars, that is to say, 47% of the group. Within the field of public health, it is worth highlighting the initiatives of research on health policies, systems and services, amounting to 7.56 million, or 46% of the total.

In relative terms, public health topics turn out to be relatively less concentrated than research based on clinical methodologies: technological R&D is allocated 2.7 million dollars throughout the five-year period and nutrition and the environment are assigned 2.5 million. Non communicable diseases and the social-economic-cultural environment of the health system are allocated over one million dollars (1.66 and 1.06 million, respectively).

If analyzed in a horizontal manner, the Table shows basic science as the most important (32%) after research in non communicable diseases (41%). On the other end, the areas that lag behind the most in funding are those related to traditional medicine and violence and accidents (0.4% and 0.2% respectively).

Hereafter there appears the behavior pattern throughout time (period 2002-2006) for these nine thematic categories, measured in fund percentages (in PPP dollars) assigned to each of them.

Figure 8. Thematic share in Allocated Amounts. PPP Dollars. 2002-2006.



Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

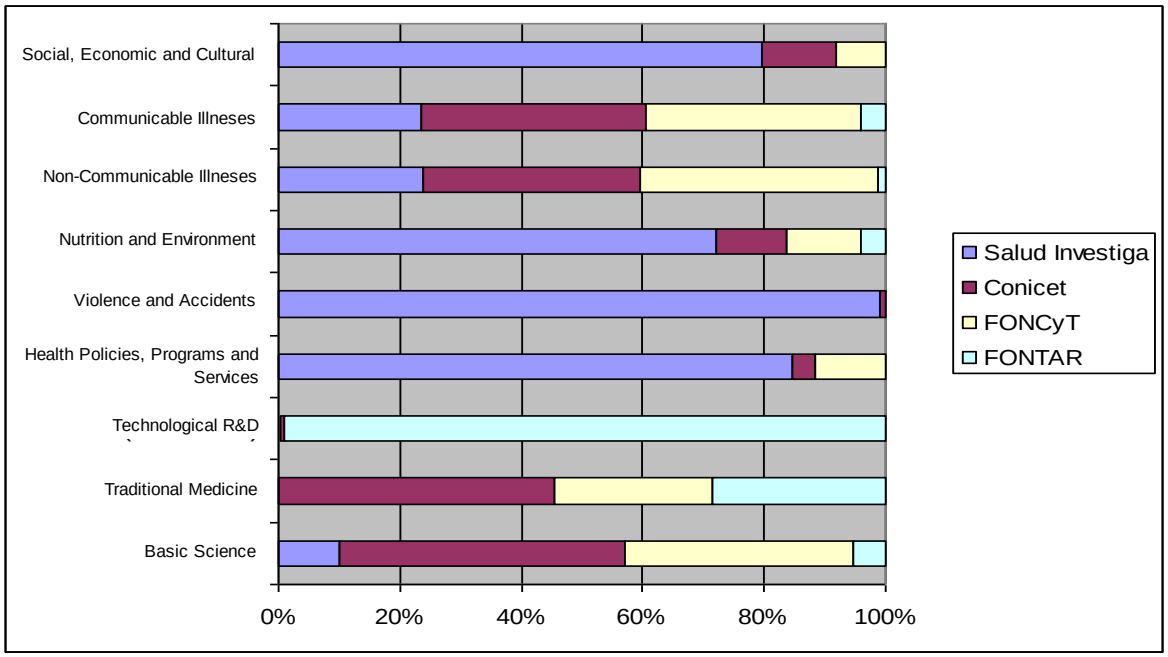
Even within a certain decreasing trend, projects on non communicable diseases systematically received a greater percentage of funds (41.24 % on average). In the last four years, basic sciences were able to attract funds to their fields of analysis, reaching a similar level to that of non communicable diseases in 2006. Topics related to technological R&D

show significant progress since the beginning of the five-year period under consideration, whilst research funds for communicable diseases and nutrition have kept relatively constant.

6.3. Coordination between institutions

From the strategic standpoint of a National Innovation System, it is presumed that there is a mechanism to coordinate or divide tasks in fund allocation for the development of new activities in the field of health. The presence of specializations is thus analyzed in how funding priorities are established, mainly at FONCyT and CONICET since they manage most of the research funds in Argentina. Figure 9 shows the share of those institutions which provide funds allocated to health research through open competition, breaking them down by topics. A breakdown of the percentage of incidence of each project category by institution appears in Table 6 of the Annex.

Figure 9. Studies by Research Topic Share in the 2002-2006 Total.



Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

In the field of technological research and development and with over 92%, FONTAR's share is almost exclusive, only marginally supplemented by CONICET. Save for this exception, FONTAR's share is low in other research topics.

Regarding the category of non communicable diseases, there is a slight prevalence of FONCyT (53.74%) compared to CONICET (48.71%) and *Salud Investiga* (32.5). Likewise, research in non communicable diseases unveils a similar distribution in terms of number of projects by institution, with CONICET taking a slight lead. On the other hand, in basic sciences, project distribution shows CONICET and FONCyT as the main contributors.

Salud Investiga heads the studies related to social sciences, particularly in topics such as violence and accidents, socioeconomic studies, research on health and nutrition policies and systems.

Institutional Bias

Finally, Table 10 represents project distribution according to the methodology and work program venue for the five-year period under consideration.

Universities (public and private) are identified as the main recipients of funds, accounting for close to 50% of the grants. Eighty percent of such projects, however, focus on biomedical issues, followed by 12.5% targeted to public health.

Public agencies and hospitals follow by order of importance, jointly totaling 603 projects. Their focus, however, differs and the former show a bias to biomedical topics and, of course, the latter to clinical and public health issues, amounting to 47% and 32.68%, respectively.

On the other hand, private agencies -with 129 projects- focus on public health research, whilst private hospitals -with only 47 projects- distribute funds equitably among the three selected disciplines.

Table 10. Funded Projects by Recipient Institution according to Methodological category

Workplace	Relation	Resarch			Total
		Biomedical	Clinical	Public Health	
Public Hospital	Quantity	51	120	83	254
	%	20.08	47.24	32.68	100.00
Private Hospital	Quantity	17	15	15	47
	%	36.17	31.91	31.91	100.00
Public Agency	Quantity	188	38	123	349
	%	53.87	10.89	35.24	100.00
Private Agency	Quantity	28	24	77	129
	%	21.71	18.60	59.69	100.00
Universities	Quantity	498	46	78	622
	%	80.06	7.40	12.54	100.00
Total	Quantity	782	243	376	1,401
	%	55.82	17.34	26.84	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga.*

7. Econometric Analysis

This section implements an econometric specification which allows identifying a potential relationship (economic and statistical) between the research methodologies and a set of variables which seem, *a priori*, relevant. This set is particularly associated with the characteristics of each researcher (sex and age), place of residence (geographical region), amount allocated and public institutions in charge of financing the projects.

Therefore, a series of logit-based estimates were made, assuming the presence of a decision-making mechanism based on which the probability of public investment in research within each category is linked to the group of regressors. In each the probability of focusing on research in each of the established research categories is estimated (biomedical, clinical, public health), where the constant figure becomes the pivot of CONICET-funded Metropolitan projects. In this regard, the working hypotheses are translated into coefficient signals, significant and marginal effects.

Among the results, coefficients related to *Salud Investiga* are significant (at 1%) in all specifications. Analyses show that the probability of finding a project funded by this institution increases in the field of clinical and public health research (by 12 and 16 percent, respectively), opposite to what happens in biomedical research.

Should the funding institution be FONCyT, the probability of the funds being allocated to a Biomedical category –when compared to CONICET- is reduced by approximately 11 percent. On the other hand, although such probability is higher in Clinical or Public Health research, unlike *Salud Investiga*, the marginal effects differ and are less intensive in this case. Therefore, the existence of specialization mechanisms at institutions is not quite clear.

Table 11. Determining factors of government-funded research, by category

Regressors	Biomedical		Clinical		Public Health	
	(1)	(2)	(1)	(2)	(1)	(2)
Funding Institution (relative to Conicet)						
Conapris	-0,4527 (0,000)*	-0,2195 (0,000)*	0,1278 (0,000)*	0,089 (0,000)*	0,1652 (0,000)*	0,0407 (0,000)*
Foncyt	-0,1181 (0,000)*	-0,0682 (0,000)*	0,0487 (0,000)*	0,0333 (0,001)*	0,0561 (0,000)*	0,0199 (0,001)*
Fontar	-0,2743 (0,000)*	-0,1893 (0,000)*	0,0744 (0,000)*	0,0573 (0,137)	0,1354 (0,000)*	0,0567 (0,000)*
Geographical Region (relative to Metropolitan)						
Pampa	0,0542 (0,001)*	0,0292 (0,024)**	-0,0155 (0,167)	-0,0115 (0,175)	-0,0227 (0,005)*	-0,0081 (0,088)***
Northwest	-0,1019 (0,001)*	-0,0613 (0,011)**	0,03 (0,128)	0,0227 (0,129)	0,0206 (0,084)***	0,0107 (0,123)
Northeast	-0,0483 (0,324)	0,0024 (0,949)	0,0622 (0,027)**	0,0492 (0,024)**	-0,0202 (0,279)	-0,0172 (0,103)
Cuyo	0,0662 (0,051)***	0,115 (0,002)*	-0,078 (0,009)*	-0,0567 (0,013)**	0,0066 (0,636)	-0,0037 (0,655)
Patagonia	-0,3306 (0,000)*	-0,2102 (0,000)*	0,1105 (0,000)*	0,0822 (0,000)*	0,0193 (0,300)	-0,0032 (0,789)
Sex	-0,0364 (0,002)*	-0,0139 (0,139)	0,0266 (0,001)*	0,0111 (0,073)***	0,0013 (0,806)	0,0023 (0,458)
Amount in PPP U$S	4,79E-07 (0,054)***	3,58E-07 (0,055)***	-5,64E-08 (0,751)	-5,34E-08 (0,676)	-3,54E-07 (0,013)**	-1,89E-07 (0,011)**
Objective (relative to SEC)						
Communicable Illnesses	- -	2,0672 (0,000)*	- -	0,0187 (0,357)	- -	-0,0827 (0,000)*
Non-Communicable Illnesses	- -	2,11 (0,000)*	- -	-0,0019 (0,917)	- -	-0,0937 (0,000)*
Nutrition and Environment	- -	1,9552 (0,000)*	- -	0,0678 (0,002)*	- -	-0,0652 (0,000)*
Violence and Accidents	- -	1,8003 (0,000)*	- -	0,0305 (0,326)	- -	-0,0488 (0,000)*
Health Policies, Systems and Services Research	- -	- -	- -	-0,083 (0,000)*	- -	0,0083 (0,289)
Technological R&D	- -	2,1123 (0,000)*	- -	-0,0259 (0,542)	- -	-0,0788 (0,000)*
Traditional Medicine	- -	- -	- -	- -	- -	-0,0938 (0,001)*
Basic Science	- -	2,3332 (0,000)*	- -	-0,1472 (0,000)*	- -	-0,1409 (0,000)*
Constant	0,3116 (0,000)*	-1,9127 (0,000)*	-0,2312 (0,000)*	-0,139 (0,000)*	-0,1649 (0,000)*	0,0123 (0,101)

* Significant at 1% ** Significant at 5% *** Significant at 10%
Source: Own development.

In terms of the researchers' gender, the study proves that the signs and significant factors differ between categories. In the Biomedical and Clinical ones, coefficients are significant. In the former area, females increase the probability of occurrence (by just over 3 %) and the opposite happens in the second case: males increase (by 2% approximately) the opportunities of identifying clinical projects. Contrariwise, this variable is not relevant in Public Health projects.

The study on how significant the amount of the grant/fellowship is indicates statistical relevance only in the cases of the Biomedical and Public Health categories. Thus, the higher the amount of resources, the greater the probability of having a Biomedical Project and the lower the possibility of having a Public Health Project. Nonetheless, given the marginal

effects that appear, it is clear that although there is statistical significance in all this, the same does not happen with economic significance, since coefficients are extremely low.

Finally, and regarding geographical distribution of resources, there are positive, significant coefficients (and marginal effects) -when compared to the Metropolitan area- in the Pampa and Cuyo regions, which lead to account for the possibility of biomedical studies. Furthermore, in Clinical projects, NEA (Northeast Argentina) and Patagonia appear with the most positive and significant coefficients. And finally, in the field of Public Health, the only region which alters research opportunities compared to the national average is NOA (Northwest Argentina).

8. Conclusions

Investment in science and technology in Argentina has grown systematically in the last five years, although less than expected when considering national revenue. Government-financed research in health seems to move in the same direction: for all analyzed institutions and measured in PPP dollars, the amount invested in health research in 2002 was 30.3 million, reaching 55.4 million in 2006, which means an increase of around 83% and a total cumulative of 205.6 million dollars throughout the five-year period.

These resources are channeled through five institutions, and four of them use open competition. This distribution shows that CONICET and FONCyT are the two main sources of grants, either through programs to support specific projects or through open competition, fellowships and systematic funding to researchers. At a significantly different level, *Salud Investiga* specializes in the financing of projects for young human resources in the field of public health, while FONTAR channels resources to Technological R&D. ANLIS, within the structure of the Ministry of Health, is the only agency under study which invests its resources in its own institutions through open competition.

On average, the funds are targeted to women (57.22%), particularly in the Metropolitan Area (51,23%), relegating social sciences to a secondary role.

The prevailing lines of work financed by the System as a whole are related to non communicable diseases, firstly, and then to Basic Sciences, an area which has developed increasingly in the last three years. In both cases the main category is Biomedicine, with minor although similar developments in Clinical and Public Health Research. Within the latter, it is worth highlighting investments in Nutrition and the Environment, socioeconomic and cultural topics and those related to Health Systems and Services. The two most relegated areas are Traditional Medicine and, lastly, Accidents and Violence which account for only 0.2% of the funds allocated to public research in health.

Whereas the epidemiological profile of a country is a suitable mechanism for resource allocation in health research, it is reasonable to note that Argentina made a significant investment in non-communicable diseases *vis a vis* communicable diseases during the analyzed period of time. However, as it will be discussed in the conclusions of this book, the priority setting mechanisms in health research is not only associated with the epidemiological profile of a country. In this sense, reducing gaps between income groups would also require more relative investment in related non-communicable diseases. Alternatively, to improve the efficiency of resources invested in health it would be necessary to allocate funds for research in disciplines related to management, insurance and access. From this perspective improving investments in health research devoted to public health should be part of a future agenda for the public sector strategy.

ANNEX

Table A1. CONICET - Number and Percentage Weight, by Type of Project

PROJECT		Relation	REGION						Total
Methodology	Topic		Metropolitan	Pampa	Northwest	Northeast	Cuyo	Patagonia	
Biomedical	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Communicable Illnesses	Quantity	248	47	9	2	0	0	306
		%	81.05	15.36	2.94	0.65	0.00	0.00	100.00
Biomedical	Non-Communicable Illnesses	Quantity	1234	298	20	7	76	0	1635
		%	75.47	18.23	1.22	0.43	4.65	0.00	100.00
Biomedical	Nutrition and Environment	Quantity	11	20	0	0	4	0	35
		%	31.43	57.14	0.00	0.00	11.43	0.00	100.00
Biomedical	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Technological R&D	Quantity	7	10	2	0	0	0	19
		%	36.84	52.63	10.53	0.00	0.00	0.00	100.00
Biomedical	Traditional Medicine	Quantity	25	3	2	0	3	0	33
		%	75.76	9.09	6.06	0.00	9.09	0.00	100.00
Biomedical	Basic Science	Quantity	968	287	17	2	67	0	1341
		%	72.18	21.40	1.27	0.15	5.00	0.00	100.00
Biomedical Subtotal		Quantity	2493	665	50	11	150	0	3369
		% of Total	74,00%	19,74%	1,48%	0,33%	4,45%	0,00%	100,00%
Clinical	Social, Economic and Cultural	Quantity	6	0	0	5	0	0	11
		%	54.55	0.00	0.00	45.45	0.00	0.00	100.00
Clinical	Communicable Illnesses	Quantity	52	6	1	0	0	0	59
		%	88.14	10.17	1.69	0.00	0.00	0.00	100.00
Clinical	Non-Communicable Illnesses	Quantity	111	23	10	0	2	5	151
		%	73.51	15.23	6.62	0.00	1.32	3.31	100.00
Clinical	Nutrition and Environment	Quantity	9	0	4	0	0	7	20
		%	45.00	0.00	20.00	0.00	0.00	35.00	100.00
Clinical	Violence and Accidents	Quantity	1	0	0	0	0	0	1
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Clinical	Health Policies, Systems and Services	Quantity	4	0	0	0	2	0	6
		%	66.67	0.00	0.00	0.00	33.33	0.00	100.00
Clinical	Technological R&D	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Basic Science	Quantity	4	0	0	0	0	0	4
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Clinical Subtotal		Quantity	181	29	15	0	4	12	241
		% of Total	75,10%	12,03%	6,22%	0,00%	1,66%	4,98%	100,00%
Public Health	Social, Economic and Cultural	Quantity	17	0	0	0	2	0	19
		%	89.47	0.00	0.00	0.00	10.53	0.00	100.00
Public Health	Communicable Illnesses	Quantity	13	2	0	0	0	0	15
		%	86.67	13.33	0.00	0.00	0.00	0.00	100.00
Public Health	Non-Communicable Illnesses	Quantity	12	0	1	0	2	0	15
		%	80.00	0.00	6.67	0.00	13.33	0.00	100.00
Public Health	Nutrition and Environment	Quantity	7	0	0	0	0	0	7
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Public Health	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Health Policies, Systems and Services	Quantity	32	0	4	2	5	0	43
		%	74.42	0.00	9.30	4.65	11.63	0.00	100.00
Public Health	Technological R&D	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Traditional Medicine	Quantity	1	0	0	0	0	0	1
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Public Health	Basic Science	Quantity	2	0	0	0	0	0	2
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Public Health Subtotal		Quantity	67	2	5	2	7	0	83
		% of Total	80,72%	2,41%	6,02%	2,41%	8,43%	0,00%	100,00%
TOTAL		Quantity	2741	696	70	13	161	12	3693
		%	74.24	18.69	1.88	0.48	4.38	0.32	100.00

NOTE: This excludes 118 observations for which there is no information on geographical location.

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A3. FONCyT - Number and Percentage Weight, by Type of Project

PROJECT		Relation	REGION						Total
Methodology	Topic		Metropolitan	Pampa	Northwest	Northeast	Cuyo	Patagonia	
Biomedical	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Communicable Illnesses	Quantity	34	6	0	0	0	0	40
		%	85.00	15.00	0.00	0.00	0.00	0.00	100.00
Biomedical	Non-Communicable Illnesses	Quantity	202	48	3	3	8	0	264
		%	76.52	18.18	1.14	1.14	3.03	0.00	100.00
Biomedical	Nutrition and Environment	Quantity	4	4	0	0	0	0	8
		%	50.00	50.00	0.00	0.00	0.00	0.00	100.00
Biomedical	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Technological R&D	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Traditional Medicine	Quantity	3	0	0	0	0	0	3
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Biomedical	Basic Science	Quantity	115	37	1	0	6	3	162
		%	70.99	22.84	0.62	0.00	3.70	1.85	100.00
Biomedical Subtotal		Quantity	358	95	4	3	14	3	477
		% of Total	75,05%	19,92%	0,84%	0,63%	2,94%	0,63%	100,00%
Clinical	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Communicable Illnesses	Quantity	13	4	0	0	0	0	17
		%	76.47	23.53	0.00	0.00	0.00	0.00	100.00
Clinical	Non-Communicable Illnesses	Quantity	38	4	0	0	0	0	42
		%	90.48	9.52	0.00	0.00	0.00	0.00	100.00
Clinical	Nutrition and Environment	Quantity	1	1	0	0	0	0	2
		%	50.00	50.00	0.00	0.00	0.00	0.00	100.00
Clinical	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Health Policies, Systems and Services	Quantity	3	0	0	0	0	0	3
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Clinical	Technological R&D	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Basic Science	Quantity	6	0	0	0	0	0	6
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Clinical Subtotal		Quantity	61	9	0	0	0	0	70
		% of Total	87,14%	12,86%	0,00%	0,00%	0,00%	0,00%	100,00%
Public Health	Social, Economic and Cultural	Quantity	0	3	0	0	0	0	3
		%	0.00	100.00	0.00	0.00	0.00	0.00	100.00
Public Health	Communicable Illnesses	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Non-Communicable Illnesses	Quantity	3	0	0	0	0	0	3
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Public Health	Nutrition and Environment	Quantity	10	0	0	0	0	0	10
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Public Health	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Technological R&D	Quantity	18	7	0	0	0	0	25
		%	72.00	28.00	0.00	0.00	0.00	0.00	100.00
Public Health	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Basic Science	Quantity	0	0	0	0	0	0	0
		%							
Public Health Subtotal		Quantity	31	10	0	0	0	0	41
		% of Total	75,61%	24,39%	0,00%	0,00%	0,00%	0,00%	100,00%
TOTAL		Cantidad	450	114	4	3	14	3	588
		%	76.53	19.39	0.68	0.51	2.38	0.51	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A4. FONTAR - Number and Percentage Weight, by Type of Project

PROJECT		Relation	REGION						Total
Methodology	Topic		Metropolitan	Pampa	Northwest	Northeast	Cuyo	Patagonia	
Biomedical	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Communicable Illnesses	Quantity	2	0	0	0	0	0	2
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Biomedical	Non-Communicable Illnesses	Quantity	1	0	0	0	0	0	1
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Biomedical	Nutrition and Environment	Quantity	0	0	0	0	1	0	1
		%	0.00	0.00	0.00	0.00	100.00	0.00	100.00
Biomedical	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Technological R&D	Quantity	72	14	0	4	2	0	92
		%	78.26	15.22	0.00	4.35	2.17	0.00	100.00
Biomedical	Traditional Medicine	Quantity	0	0	1	0	0	0	1
		%	0.00	0.00	100.00	0.00	0.00	0.00	100.00
Biomedical	Basic Science	Quantity	2	4	0	0	1	0	7
		%	28.57	57.14	0.00	0.00	14.29	0.00	100.00
Biomedical Subtotal		Quantity	77	18	1	4	4	0	104
		% of Total	43,02%	10,06%	0,56%	2,23%	2,23%	0,00%	58,10%
Clinical	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Communicable Illnesses	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Non-Communicable Illnesses	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Nutrition and Environment	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Technological R&D	Quantity	23	3	0	3	0	0	29
		%	79.31	10.34	0.00	10.34	0.00	0.00	100.00
Clinical	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Basic Science	Quantity	0	0	0	0	0	0	0
		%							
Clinical Subtotal		Quantity	23	3	0	3	0	0	29
		% of Total	11,00%	1,44%	0,00%	1,44%	0,00%	0,00%	13,88%
Public Health	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Communicable Illnesses	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Non-Communicable Illnesses	Quantity	0	0	2	0	0	0	2
		%	0.00	0.00	100.00	0.00	0.00	0.00	100.00
Public Health	Nutrition and Environment	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Violence and Accidents	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Technological R&D	Quantity	22	13	5	1	0	2	43
		%	51.16	30.23	11.63	2.33	0.00	4.65	100.00
Public Health	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Basic Science	Quantity	0	0	0	0	0	0	0
		%							
Public Health Subtotal		Quantity	22	13	7	1	0	2	45
		% of Total	6,13%	3,62%	1,95%	0,28%	0,00%	0,56%	12,53%
TOTAL		Quantity	122	34	8	8	4	2	178
		%	68.54	19.10	4.49	4.49	2.25	1.12	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A5. *Salud Investiga* - Number and Percentage Weight, by Type of Project

PROJECT		Relation	REGION						Total
Methodology	Topic		Metropolitan	Pampa	Northwest	Northeast	Cuyo	Patagonia	
Biomedical	Social, Economic and Cultural	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Communicable Illnesses	Quantity	18	4	5	0	1	1	29
		%	62.07	13.79	17.24	0.00	3.45	3.45	100.00
Biomedical	Non-Communicable Illnesses	Quantity	67	9	6	1	3	2	88
		%	76.14	10.23	6.82	1.14	3.41	2.27	100.00
Biomedical	Nutrition and Environment	Quantity	2	3	0	1	1	0	7
		%	28.57	42.86	0.00	14.29	14.29	0.00	100.00
Biomedical	Violence and Accidents	Quantity	0	0	1	0	0	0	1
		%	0.00	0.00	100.00	0.00	0.00	0.00	100.00
Biomedical	Health Policies, Systems and Services	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Technological R&D	Quantity	1	0	0	0	0	0	1
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Biomedical	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Biomedical	Basic Science	Quantity	33	9	2	6	2	1	53
		%	62.26	16.98	3.77	11.32	3.77	1.89	100.00
Biomedical Subtotal		Quantity	121	25	14	8	7	4	179
		% of Total	67,60%	13,97%	7,82%	4,47%	3,91%	2,23%	100,00%
Clinical	Social, Economic and Cultural	Quantity	4	1	0	0	0	0	5
		%	80.00	20.00	0.00	0.00	0.00	0.00	100.00
Clinical	Communicable Illnesses	Quantity	12	1	1	0	0	1	15
		%	80.00	6.67	6.67	0.00	0.00	6.67	100.00
Clinical	Non-Communicable Illnesses	Quantity	81	13	10	3	3	2	112
		%	72.32	11.61	8.93	2.68	2.68	1.79	100.00
Clinical	Nutrition and Environment	Quantity	30	8	2	2	1	2	45
		%	66.67	17.78	4.44	4.44	2.22	4.44	100.00
Clinical	Violence and Accidents	Quantity	6	4	0	0	0	0	10
		%	60.00	40.00	0.00	0.00	0.00	0.00	100.00
Clinical	Health Policies, Systems and Services	Quantity	14	2	1	2	1	2	22
		%	63.64	9.09	4.55	9.09	4.55	9.09	100.00
Clinical	Technological R&D	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Clinical	Basic Science	Quantity	0	0	0	0	0	0	0
		%							
Clinical Subtotal		Quantity	147	29	14	7	5	7	209
		% of Total	70,33%	13,88%	6,70%	3,35%	2,39%	3,35%	100,00%
Public Health	Social, Economic and Cultural	Quantity	24	2	2	1	2	1	32
		%	75.00	6.25	6.25	3.13	6.25	3.13	100.00
Public Health	Communicable Illnesses	Quantity	5	1	0	1	0	0	7
		%	71.43	14.29	0.00	14.29	0.00	0.00	100.00
Public Health	Non-Communicable Illnesses	Quantity	33	4	3	3	0	1	44
		%	75.00	9.09	6.82	6.82	0.00	2.27	100.00
Public Health	Nutrition and Environment	Quantity	20	1	0	0	2	1	24
		%	83.33	4.17	0.00	0.00	8.33	4.17	100.00
Public Health	Violence and Accidents	Quantity	10	2	2	0	0	0	14
		%	71.43	14.29	14.29	0.00	0.00	0.00	100.00
Public Health	Health Policies, Systems and Services	Quantity	174	22	20	3	7	11	237
		%	73.42	9.28	8.44	1.27	2.95	4.64	100.00
Public Health	Technological R&D	Quantity	1	0	0	0	0	0	1
		%	100.00	0.00	0.00	0.00	0.00	0.00	100.00
Public Health	Traditional Medicine	Quantity	0	0	0	0	0	0	0
		%							
Public Health	Basic Science	Quantity	0	0	0	0	0	0	0
		%							
Public Health Subtotal		Quantity	267	32	27	8	11	14	359
		% of Total	74,37%	8,91%	7,52%	2,23%	3,06%	3,90%	100,00%
TOTAL		Quantity	535	86	55	23	23	25	747
		%	71.62	11.51	7.36	3.08	3.08	3.35	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A6. Distribution of Projects by Institution and Region. Percentage share of Total Competitive Grants

Project			Region						
Institution	Methodology	Topic	Metropolitan	Pampa	Northwest	Northeast	Cuyo	Patagonia	TOTAL
Salud Investiga	Biomedical	Communicable Illnesses	0,34%	0,08%	0,10%	0,00%	0,02%	0,02%	**0,55%**
	Biomedical	Non-Communicable Illnesses	1,28%	0,17%	0,11%	0,02%	0,06%	0,04%	**1,68%**
	Biomedical	Nutrition and Environment	0,04%	0,06%	0,00%	0,02%	0,02%	0,00%	**0,13%**
	Biomedical	Violence and Accidents	0,00%	0,00%	0,02%	0,00%	0,00%	0,00%	**0,02%**
	Biomedical	Technological R&D	0,02%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,02%**
	Biomedical	Basic Science	0,63%	0,17%	0,04%	0,11%	0,04%	0,02%	**1,01%**
	Clinical	Social, Economic and Cultural	0,08%	0,02%	0,00%	0,00%	0,00%	0,00%	**0,10%**
	Clinical	Communicable Illnesses	0,23%	0,02%	0,02%	0,00%	0,00%	0,02%	**0,29%**
	Clinical	Non-Communicable Illnesses	1,55%	0,25%	0,19%	0,06%	0,06%	0,04%	**2,14%**
	Clinical	Nutrition and Environment	0,57%	0,15%	0,04%	0,04%	0,02%	0,04%	**0,86%**
	Clinical	Violence and Accidents	0,11%	0,08%	0,00%	0,00%	0,00%	0,00%	**0,19%**
	Clinical	Health Policies, Systems and Services	0,27%	0,04%	0,02%	0,04%	0,02%	0,04%	**0,42%**
	Public Health	Social, Economic and Cultural	0,46%	0,04%	0,04%	0,02%	0,04%	0,02%	**0,61%**
	Public Health	Communicable Illnesses	0,10%	0,02%	0,00%	0,02%	0,00%	0,00%	**0,13%**
	Public Health	Non-Communicable Illnesses	0,63%	0,08%	0,06%	0,06%	0,00%	0,02%	**0,84%**
	Public Health	Nutrition and Environment	0,38%	0,02%	0,00%	0,00%	0,04%	0,02%	**0,46%**
	Public Health	Violence and Accidents	0,19%	0,04%	0,04%	0,00%	0,00%	0,00%	**0,27%**
	Public Health	Health Policies, Systems and Services	3,32%	0,42%	0,38%	0,06%	0,13%	0,21%	**4,53%**
	Public Health	Technological R&D	0,02%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,02%**
Salud Investiga Total			**10,22%**	**1,64%**	**1,05%**	**0,44%**	**0,44%**	**0,48%**	**14,27%**
Conicet	Biomedical	Communicable Illnesses	4,74%	0,90%	0,17%	0,04%	0,00%	0,00%	**5,84%**
	Biomedical	Non-Communicable Illnesses	23,57%	5,69%	0,38%	0,13%	1,45%	0,00%	**31,23%**
	Biomedical	Nutrition and Environment	0,21%	0,38%	0,00%	0,00%	0,08%	0,00%	**0,67%**
	Biomedical	Technological R&D	0,13%	0,19%	0,04%	0,00%	0,00%	0,00%	**0,36%**
	Biomedical	Traditional Medicine	0,48%	0,06%	0,04%	0,00%	0,06%	0,00%	**0,63%**
	Biomedical	Basic Science	18,49%	5,48%	0,32%	0,04%	1,28%	0,00%	**25,61%**
	Clinical	Social, Economic and Cultural	0,11%	0,00%	0,00%	0,10%	0,00%	0,00%	**0,21%**
	Clinical	Communicable Illnesses	0,99%	0,11%	0,02%	0,00%	0,00%	0,00%	**1,13%**
	Clinical	Non-Communicable Illnesses	2,12%	0,44%	0,19%	0,00%	0,04%	0,10%	**2,88%**
	Clinical	Nutrition and Environment	0,17%	0,00%	0,08%	0,00%	0,00%	0,13%	**0,38%**
	Clinical	Violence and Accidents	0,02%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,02%**
	Clinical	Health Policies, Systems and Services	0,08%	0,00%	0,00%	0,00%	0,04%	0,00%	**0,11%**
	Clinical	Basic Science	0,08%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,08%**
	Public Health	Social, Economic and Cultural	0,32%	0,00%	0,00%	0,00%	0,04%	0,00%	**0,36%**
	Public Health	Communicable Illnesses	0,25%	0,04%	0,00%	0,00%	0,00%	0,00%	**0,29%**
	Public Health	Non-Communicable Illnesses	0,23%	0,00%	0,02%	0,00%	0,04%	0,00%	**0,29%**
	Public Health	Nutrition and Environment	0,13%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,13%**
	Public Health	Health Policies, Systems and Services	0,61%	0,00%	0,08%	0,04%	0,10%	0,00%	**0,82%**
	Public Health	Traditional Medicine	0,02%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,02%**
	Public Health	Basic Science	0,04%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,04%**
Conicet Total			**52,79%**	**13,29%**	**1,34%**	**0,34%**	**3,11%**	**0,23%**	**71,10%**
FONCyT	Biomedical	Communicable Illnesses	0,65%	0,11%	0,00%	0,00%	0,00%	0,00%	**0,76%**
	Biomedical	Non-Communicable Illnesses	3,86%	0,92%	0,06%	0,06%	0,15%	0,00%	**5,04%**
	Biomedical	Nutrition and Environment	0,08%	0,08%	0,00%	0,00%	0,00%	0,00%	**0,15%**
	Biomedical	Traditional Medicine	0,06%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,06%**
	Biomedical	Basic Science	2,20%	0,71%	0,02%	0,00%	0,11%	0,06%	**3,09%**
	Clinical	Communicable Illnesses	0,25%	0,08%	0,00%	0,00%	0,00%	0,00%	**0,32%**
	Clinical	Non-Communicable Illnesses	0,73%	0,08%	0,00%	0,00%	0,00%	0,00%	**0,80%**
	Clinical	Nutrition and Environment	0,02%	0,02%	0,00%	0,00%	0,00%	0,00%	**0,04%**
	Clinical	Health Policies, Systems and Services	0,06%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,06%**
	Clinical	Basic Science	0,11%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,11%**
	Public Health	Social, Economic and Cultural	0,00%	0,06%	0,00%	0,00%	0,00%	0,00%	**0,06%**
	Public Health	Communicable Illnesses	0,06%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,06%**
	Public Health	Non-Communicable Illnesses	0,19%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,19%**
	Public Health	Health Policies, Systems and Services	0,34%	0,13%	0,00%	0,00%	0,00%	0,00%	**0,48%**
FONCyT Total			**8,59%**	**2,18%**	**0,08%**	**0,06%**	**0,27%**	**0,06%**	**11,23%**
FONTAR	Biomedical	Communicable Illnesses	0,04%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,04%**
	Biomedical	Non-Communicable Illnesses	0,02%	0,00%	0,00%	0,00%	0,00%	0,00%	**0,02%**
	Biomedical	Nutrition and Environment	0,00%	0,00%	0,00%	0,00%	0,02%	0,00%	**0,02%**
	Biomedical	Technological R&D	1,38%	0,27%	0,00%	0,08%	0,04%	0,00%	**1,76%**
	Biomedical	Traditional Medicine	0,00%	0,00%	0,02%	0,00%	0,00%	0,00%	**0,02%**
	Biomedical	Basic Science	0,04%	0,08%	0,00%	0,00%	0,02%	0,00%	**0,13%**
	Clinical	Technological R&D	0,44%	0,06%	0,00%	0,06%	0,00%	0,00%	**0,55%**
	Public Health	Non-Communicable Illnesses	0,00%	0,00%	0,04%	0,00%	0,00%	0,00%	**0,04%**
	Public Health	Technological R&D	0,42%	0,25%	0,10%	0,02%	0,00%	0,04%	**0,82%**
FONTAR Total			**2,33%**	**0,65%**	**0,15%**	**0,15%**	**0,08%**	**0,04%**	**3,40%**
T O T A L			**73,93%**	**17,76%**	**2,62%**	**0,99%**	**3,90%**	**0,80%**	**100,00%**

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A2. Grants by Type. 2002-2006

Research	Relation	Type of Grant			Total
		Researchers	Fellows	Calls	
Biomedical	Quantity	2,013	534	902	3,449
	%	90.31	85.71	91.20	89.79
Clinical	Quantity	156	69	60	285
	%	7.00	11.08	6.07	7.42
Public Health	Quantity	60	20	27	107
	%	2.69	3.21	2.73	2.79
Total	Quantity	2,229	623	989	3,841
	%	100.00	100.00	100.00	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A7. Projects Distribution by Methodological Category and Institution. 2002-2006 Total.

Institution	Period	Research (%)			Total
		Biomedical	Clinical	Public Health	
CONICET	**2002**	88,85	7,49	3,66	100
	2003	89,21	7,87	2,92	100
	2004	89,13	7,92	2,95	100
	2005	90,42	7,09	2,49	100
	2006	90,23	7,28	2,48	100
FONCyT	**2002**	79,71	13,77	6,52	100
	2003	81,01	11,73	7,26	100
	2004	82,13	10,29	6,84	100
	2005	83,7	9,78	7,05	100
FONTAR	**2002**	100	0	0	100.00
	2003	60,71	25	14,29	100.00
	2004	61,54	11,54	26,92	100.00
	2005	57,38	14,75	27,87	100.00
	2006	55,74	16,39	27,87	100.00
Salud Investiga	**2002**	31,48	25,00	43,52	100.00
	2003	25,21	28,57	46,22	100.00
	2004	20,83	36,11	43,06	100.00
	2005	22,97	19,62	57,42	100.00
	2006	23,16	33,33	43,50	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A8a. Matrix of Research Projects in Argentina. PPP Dollars. 2002 Total

Categories Objective	Research Methodology			
	Biomedical	Clinical	Public Heatlh	TOTAL
Social, Economic and Cultural	-	77868 (2)	382232 (24)	**460100 (26)**
Communicable Illnesses	2952997 (62)	895084 (20)	155924 (6)	**4004005 (88)**
Non-Communicable Illnesses	11501293,7 (326)	1510939,66 (43)	218448 (9)	**13230681,4 (378)**
Nutrition and Environment	262434,66 (8)	181427,66 (9)	354325 (5)	**798187,32 (22)**
Violence and Accidents	-	26400 (2)	33000 (2)	**59400 (4)**
Health Policies, Systems and Services Research	-	320619 (12)	1130352,33 (34)	**1450971,33 (46)**
Technological R&D	172188 (6)	-	-	**172188 (6)**
Traditional Medicine	260440 (8)	-	5400 (1)	**265840 (9)**
Basic Science	9644292 (276)	217083 (4)	-	**9861375 (280)**
TOTAL	**24793645,4 (686)**	**3229421,32 (92)**	**2279681,33 (81)**	**30302748 (859)**

Source: Own development based on Conicet, ANPCyT, *Salud Investiga* and ANLIS.
Note: Between brackets is the number of projects per category

Table A8b. Matrix of Research Projects in Argentina. PPP Dollars. 2003 Total

Categories Objective	Research Methodology			
	Biomedical	Clinical	Public Heatlh	TOTAL
Social, Economic and Cultural	-	82329,8 (3)	195433,2 (8)	**277763 (11)**
Communicable Illnesses	2732585 (60)	753554 (16)	137216,3 (5)	**3623355,3 (81)**
Non-Communicable Illnesses	11953837,2 (289)	1493766,6 (45)	185384,5 (5)	**13632988,3 (339)**
Nutrition and Environment	190597,2 (6)	331163 (18)	377497,8 (3)	**899258 (27)**
Violence and Accidents	-	45212,8 (3)	41666,7 (3)	**86879,5 (6)**
Health Policies, Systems and Services Research	-	205250,6 (5)	1359738 (59)	**1564988,6 (64)**
Technological R&D	1664712,7 (17)	362271,3 (7)	164311,2 (4)	**2191295,2 (28)**
Traditional Medicine	163613,5 (4)	-	-	**163613,5 (4)**
Basic Science	8785969 (219)	176651,6 (2)	-	**8962620,6 (221)**
TOTAL	**25491314,6 (595)**	**3450199,7 (99)**	**2461247,7 (87)**	**31402762 (781)**

Source: Own development based on Conicet, ANPCyT, *Salud Investiga* and ANLIS.

Note: Between brackets is the number of projects per category

Table A8c. Matrix of Research Projects in Argentina. PPP Dollars. 2004 Total

Categories Objective	Research Methodology			
	Biomedical	Clinical	Public Heatlh	TOTAL
Social, Economic and Cultural	-	107390 (5)	131603,9 (4)	**238993,9 (9)**
Communicable Illnesses	2865058 (72)	756768 (18)	118546,7 (4)	**3740372,7 (94)**
Non-Communicable Illnesses	14985533,7 (335)	1813033,89 (72)	249071,4 (10)	**17047639 (417)**
Nutrition and Environment	199558 (7)	194190 (10)	394087,34 (3)	**787835,34 (20)**
Violence and Accidents	-	28333,34 (2)	137500 (9)	**165833,34 (11)**
Health Policies, Systems and Services Research	-	103572,2 (8)	1290444,1 (61)	**1394016,3 (69)**
Technological R&D	1231142,7 (18)	135806,39 (3)	331130,84 (8)	**1698079,93 (29)**
Traditional Medicine	179756,67 (5)	-	-	**179756,67 (5)**
Basic Science	12293720,5 (245)	166052,5 (2)	-	**12459773 (247)**
TOTAL	**31754769,6 (682)**	**3305146,32 (120)**	**2652384,28 (99)**	**37712300,2 (901)**

Source: Own development based on Conicet, ANPCyT, *Salud Investiga* and ANLIS.

Note: Between brackets is the number of projects per category

Table A8d. Matrix of Research Projects in Argentina. PPP Dollars. 2005 Total

Categories Objective	Research Methodology			
	Biomedical	Clinical	Public Heatlh	TOTAL
Social, Economic and Cultural	-	92868 (3)	184590,66 (8)	**277458,66 (11)**
Communicable Illnesses	4812358,64 (100)	684943,8 (26)	99916 (7)	**5597218,44 (133)**
Non-Communicable Illnesses	15715551,8 (528)	1986174,5 (71)	768309 (38)	**18470035,3 (647)**
Nutrition and Environment	265274,67 (14)	306542 (15)	660214 (12)	**1232030,67 (41)**
Violence and Accidents	-	37000 (2)	-	**37000 (2)**
Health Policies, Systems and Services Research	-	297881,66 (8)	1800665,03 (90)	**2098546,69 (98)**
Technological R&D	3126916,71 (37)	643301 (9)	1111510,61 (16)	**4881728,32 (62)**
Traditional Medicine	24516 (10)	-	-	**24516 (10)**
Basic Science	16252489,5 (407)	210958,2 (1)	1561,5 (1)	**16465009,2 (414)**
TOTAL	**40197107,3 (1111)**	**4259669,16 (135)**	**4626766,8 (172)**	**49083543,26 (1418)**

Source: Own development based on Conicet, ANPCyT, *Salud Investiga* and ANLIS.

Note: Between brackets is the number of projects per category

Table A8e. Matrix of Research Projects in Argentina. PPP Dollars. 2006 Total

Categories Objective	Research Methodology			
	Biomedical	Clinical	Public Heatlh	TOTAL
Social, Economic and Cultural	-	124020 (4)	170414 (10)	**294434 (14)**
Communicable Illnesses	5564590,07 (112)	925590,66 (26)	138408 (6)	**6628588,73 (144)**
Non-Communicable Illnesses	17744852 (562)	2138689,26 (91)	242595,33 (12)	**20126136,6 (665)**
Nutrition and Environment	296265 (17)	316542 (15)	705561 (11)	**1318368 (43)**
Violence and Accidents	17000 (1)	34000 (2)	15000 (1)	**66000 (4)**
Health Policies, Systems and Services Research	-	367802 (9)	1979039,7 (68)	**2346841,7 (77)**
Technological R&D	3344036,23 (34)	999105,38 (10)	1072603,45 (16)	**5415745,06 (60)**
Traditional Medicine	231412 (10)	-	-	**231412 (10)**
Basic Science	18963636,7 (437)	31152 (1)	1980 (1)	**18996768,7 (439)**
TOTAL	**46161792 (1173)**	**4936901 (158)**	**4325601,5 (125)**	**55424294,5 (1456)**

Source: Own development based on Conicet, ANPCyT, *Salud Investiga* and ANLIS.

Note: Between brackets is the number of projects per category

Table A9. Funded Projects by institution and Research Topic in in number and percentage. 2002-2006

Workplace	Relation	Research									Total
		Social, Economic and Cultural	Communicable Illnesses	Non-Communicable Illnesses	Nutrition and Environment	Violence and Accidents	Health Policies, Systems and Services	Technological R&D	Traditional Medicine	Basic Science	
Public Hospital	Quantity	13	23	114	30	14	46	1	0	13	254
	%	5.12	9.06	44.88	11.81	5.51	18.11	0.39	0.00	5.12	100.00
Private Hospital	Quantity	2	0	24	5	0	12	1	0	3	47
	%	4.26	0.00	51.06	10.64	0.00	25.53	2.13	0.00	6.38	100.00
Public Agency	Quantity	8	32	118	15	10	94	1	4	67	349
	%	2.29	9.17	33.81	4.30	2.87	26.93	0.29	1.15	19.20	100.00
Private Agency	Quantity	12	7	22	7	0	62	0	1	18	129
	%	9.30	5.43	17.05	5.43	0.00	48.06	0.00	0.78	13.95	100.00
Universities	Quantity	9	40	282	30	3	43	3	9	203	622
	%	1.45	6.43	45.34	4.82	0.48	6.91	0.48	1.45	32.64	100.00
Total	Quantity	44	102	560	87	27	257	6	14	304	1,401
	%	3.14	7.28	39.97	6.21	1.93	18.34	0.43	1.00	21.70	100.00

Source: Based on information provided by ANPCyT, CONICET and *Salud Investiga*

Table A10. Share by Topics in Allocated Amounts. 2002-2006

Categories Objective	2002	2003	2004	2005	2006
Social, Economic and Cultural	1,52%	0,88%	0,63%	0,57%	0,53%
Communicable Illnesses	13,21%	11,54%	9,92%	11,40%	11,96%
Non-Communicable Illnesses	43,66%	43,41%	45,20%	37,63%	36,31%
Nutrition and Environment	2,63%	2,86%	2,09%	2,51%	2,38%
Violence and Accidents	0,20%	0,28%	0,44%	0,08%	0,12%
Health Policy, Systems and Services Research	4,79%	4,98%	3,70%	4,28%	4,23%
Technological R&D	0,57%	6,98%	4,50%	9,95%	9,77%
Traditional Medicine	0,88%	0,52%	0,48%	0,05%	0,42%
Basic Science	32,54%	28,54%	33,04%	33,54%	34,28%
Total	**100,00%**	**100,00%**	**100,00%**	**100,00%**	**100,00%**

Source: Based on information provided by ANPCyT, CONICET, *Salud Investiga* and ANLIS.

The Public Funding of Health Research in Bolivia[16]

Fernando Aramayo Carrasco[17]

1. Introduction

Bolivia is a country locked in an ongoing debate about the best way to manage its health sector. Since the election of President Morales in 2005, traditional medicine has been revaluated and social policy has been defined as a high priority by the government. Consequently, the usual focus on the economy due to the traumatic hyperinflation of the eighties, whereby macroeconomic stability and economic growth were the central matters of the government's agenda, has been set aside.

Decentralization and deconcentration, initiated in the second half of the nineties, brought great benefits to the health sector, mainly because it allowed the presence of the State –and along with it, its resources- in geographic areas of the country where access to health services was virtually inexistent. Thus, popular participation and administrative decentralization forged a decentralized conceptualization of the health sector, revealing deficiencies particular to the different geographical regions of the country, of which its main obstacle basically lie in cultural, social and economic factors.

At present, critics and the national government debate over the poor results and impact of the government policies regarding key indicators of the country's health system after an average yearly investment in the social sector of about US$ 600 million. The Sector Development Plan of the Ministry of Health and Sports – the state agency that regulates the health sector – explains the health situation of the country by revealing that currently 77% of the population is excluded from health services, especially in the regions of the *Altiplano* (high plains) and the rural valleys.

Table 1. Social and Economic Indicators in Bolivia

Indicator	Unit of Measure	Period	Value
Population	millions of persons	2007	9,83
Gross Domestic Product at constants prices (p)	millions of dolars	2007	13.039
Growth	Percentage	2007	4,6
Inflation	Percentage	2007	11,73
Gross Domestic Product per cápita	American Dolars	2007	1.327
Life expectancy at birth (e)	Years	2005–2010	65,51
Gross Mortality Rate (e)	Deaths per thousand inhabitants	2005–2010	7,55
Infant Mortality Rate (e)	Deaths of children under one year per thousand live births	2005–2010	45,6

Source: Based on information provided by Instituto Nacional de Estadística
(p) Preliminary
(e) Estimations for period: 2005-2010

[16] This work benefited from the collaboration of Dr. Rosemary Durán, Leonardo Téllez, and the valuable contribution of Dr. María Bolivia Rothe, Chief of the Epidemiology Unit at the Ministry of Health and Sports. I would also like to thank the helpful attitude of Eduardo Vacaflores, General Director of Administrative Matters and Ciro Puma, responsible for the National Budget at the Ministry of Health and Sports.
[17] Researcher of Management and Public Policies.

Diseases that require mandatory reporting and are part of the epidemiologic profile of the country, are: 1) Measles/German measles, 2) Meningococcal Meningitis, 3) Hantavirus 4) Yellow Fever 5) Whooping Cough, 6) Cholera, 7) Hemorrhagic Bolivian Fever, 8) Classic Dengue Fever, 9) Diphtheria, 10) Human Rabies, 11) Plague and 12) Hemorrhagic Dengue Fever.

2. Regulatory institutional framework

The state Health Innovation System in Bolivia is made up of government agencies and institutions of higher learning. The former are headed –regarding regulatory authority- by the Vice Minister of Science and Technology,[18] under the Ministry of Planning and Development, whose duties are determined by the Strategic Guidelines of the National Development Plan (*Lineamientos Estratégicos del Plan Nacional de Desarrollo - PND*) 2006–2011, which states that:

> *Science, Technology and Innovation (CTI) are fundamental instruments for development and their activities are of great priority for the government in all production and service sectors: Manufacture, Agriculture and Farming, Rural Development, Hydrocarbons, Mining, Education, Health, Economy, Culture, Environment, Ancestral Wisdom, among others; for these reasons they become transversal in nature in a Worthy, Sovereign, Democratic, and Productive Bolivia to Live Well."*
>
> *"In Bolivia, the creation of Science, Technology, and Innovation is carried out by numerous contributors: NGOs, consultants, government projects and programs, and public and private research institutions. However, the information related to this sector is not divulged; in most cases, it is not systemized, so there are many difficulties in using it for the benefit of the country's development. In addition to the lack of a national policy on information, there are deficiencies regarding the development and implementation of mechanisms and/or platforms that can facilitate the systematization, diffusion, and consequently, access to information".* [19]

This statement about the importance of science and technology when implementing the PND and the adoption of the new conceptualization of policies in the health sector has yet to receive material support or resources. The government's key actor for scientific research and development is the Ministry of Health and Sports (*Ministerio de Salud y Deportes – MSD*) that is responsible for the sector's policies according to the Organization of Executive Power Act (Ley de Organización del Poder Ejecutivo – LOPE) of February 21, 2006, which defines the duties of the Ministry as follows:

- To design, to implement, and to evaluate the performance of health programs within the framework of the country's development policy.
- To regulate, to plan for, to control, and to guide the National Health System, made up of the short-term social security subsectors: public and private, for profit and non-profit, and traditional medicine.
- To guarantee the population's wellness by promoting health, disease prevention, healing and rehabilitation.
- To direct, to regulate and to carry out policies for the entire health system.
- To standardize international cooperation in the health sector with the policies, priorities, and rules established by the National Government.

[18] Agency of direction, coordination and management of actions defined in scientific, technological and innovation politics, Law. 2209 of June 8, 2001.
[19] http://www.cienciaytecnologia.gob.bo/programas/SIBICYT/ResumenEjecutivo.htm.

- To regulate the performance of educational and training institutes within the health sector, with the exception of public universities, in coordination with the Ministry of Education and Culture.

The role of the MSD is to rule and regulate the national health system; its presence at the subnational level is carried out by Departmental Health Services (Servicios Departamentales de Salud – SEDES) which are decentralized entities that function within the prefectures of the departments.

The Bolivian health system is organized in three subsystems:

a. The Public Subsector, headed by the Ministry of Health and Sports (Ministerio de Salud y Deportes – MSD) made up of General Hospitals, Support Hospitals, Health Centers and "Postas" (smaller health centers).

b. Social Security[20], made up of Policlinic Hospital and Medical Assistance Centers.

c. The Private Subsector, made up of clinics and specialized centers – private, formal and traditional medical assistance and non governmental organizations. Private health insurance -which given the way it is set up involves insurance companies and the Superintendence of Pensions, Value, and Insurance (Superintendencia de Pensiones, Valores y Seguros) - belongs to this sector, yet is dealt with separately due to the nature of its activities.

Consequently, the MSD is fundamentally a regulatory agency, and as such its specific purpose is to establish health policies to be implemented at the national level, whereas the subnational level (departments and municipal districts) are left with an operative role. The organization of the sector establishes three levels of reference for service provision, shown in Table 2.

Table 2. Organization of Health Sector for Hiring Services

Reference Level	Feature of the benefit
First Level	It corresponds to the health care whose servicies supply is related to health promotion and prevetion, outpatient consultation and transit inpatient. This level of attention includes: tradicional medicien, mobile brigade health, health stands, medical consultation, health centre with or without beds, polyclinics and polyconsultations; it is the entrance to the health care system.
Second Level	It corresponds to the benefits that requiers outpatient attention of more complexity and inpatient servicies caused by basic specialties of internal medicine, surgery, pediatrics, gynecological and obstetrics; anesthesiology, complementary servicies of diagnosis and treatment and traumatology. The operational unit of this level is the Basic Hospital.
Third Level	It corresponds to the speciality outpatient servicies; inpatient servicies of speciality and subspecialities; complementary servicies of diagnosis and treatments of high technology and complexity. The operational units of this level are the General Hospitals and Institutes and Speciality Hospitals.

Source: Own development.

The following research institutes are part of the Ministry of Health and Sports:

- Bolivian Institute for the Blind (Instituto Boliviano de la Ceguera – IBC),
- Bolivian Institute of Sports, Physical Education and Recreation (Instituto Boliviano del Deporte, la Educación Física y la Recreación – IBDEFR),
- National Institute of Health Laboratories (Instituto Nacional de Laboratorios de Salud – INLASA),

[20] The National Health Fund (Caja Nacional de Salud – CNS) belongs to this subsector.

- National Institute of Occupational Health (Instituto Nacional de Salud Ocupacional - INSO)
- National Institute of Public Health (Instituto Nacional de Salud Pública – INSP),
- National Institute of Health Insurance (Instituto Nacional de Seguros de Salud – INASES).

According to current regulations (2002), the following institutes are under the jurisdiction of the Sucre Institute of Public Health:

- The Santa Cruz Center for Tropical Diseases (Centro de Enfermedades Tropicales de Santa Cruz - CENETROP),
- The Institute of Nuclear Medicine (Instituto de Medicina Nuclear – IMN),
- The National Institute of Health Laboratories (Instituto Nacional de Laboratorios de Salud – INLASA),
- National Center of Epidemiology and Environmental Health of the South (Centro Nacional de Epidemiología y Salud Ambiental del Sur - CENESA Sur).

However, as the Sucre Institute of Public Health is not still operational, the aforementioned institutes are still under national jurisdiction.

In March of 2008, under the leadership of the Ministry of Health and Sports, the institutions involved in the health sector were invited to participate in the design of a "National Agenda of Research Priorities in Health." The following conclusions were reached regarding health research:

- The country's "research policy" has been *laissez faire* rather than strengthening of the MSD's direction and leadership.
- The endeavor to drive change did not produce the expected results, the situation remained with the same diagnosis and the same recommendations, the proposals were considered unfeasible and the priorities were not clearly defined.
- The country has incipient scientific and technological development.
- The growth of infrastructure and scientific production has been moderate.

This assessment of the current situation regarding the development of science and technology underestimates the efforts of institutions like the Ministry of Health and Sports that hire consultants in epidemiology and other areas and initiate research processes without the aid of grants due to their inexistence in the public system.

In the same way, public institutions of higher education, whose role has been fundamental – especially in the health sector— are key actors of the system of scientific and technological innovation. Among these, the University Mayor of San Andrés- UMSA, whose structure– through the Department of Research, Graduate Studies, and Social Interaction (Departamento de Investigación, Postgrado e Interacción Social – DIPGIS) is integrated into three research institutes: i) Institute of Genetics, ii) Bolivian Institute of High Altitude Biology (Instituto Boliviano de Biología de la Altura – IBBA), and iii) Institute for Health and Development Research. These centers carry out basic, applied, and experimental research.

2.1. Actors matrix

Additionally, clinical research performed in hospitals should also be considered.

Unfortunately, there are no centralized records for this type of research or its results, and consequently of resources assigned to it. For this reason the present study does not include it in the government innovation system.

Thus, it is possible to identify key national public actors for research in the health sector with existing physical, financial and human resources which are the source for the study results presented below. These actors are:

- Vice-Ministry of Science and Technology (Viceministerio de Ciencia y Tecnología – MPD) under the Ministry of Development Planning,
- Vice-Ministry of Health, under the Ministry of Health and Sports,
- Vice-Ministry of Traditional Medicine and Intercultural Affairs, also under the Ministry of Health and Sports, and
- University Mayor of San Andrés – UMSA that enjoys autonomous status as determined by the CPE.

Moreover, private laboratories that carry out for-profit research projects and whose processes –calls for projects or resources assigned— are not made public, were not included in this study.

3. Methodology and sources

In Bolivia, data on Expenditures in Health Research and Development ("Gasto en Investigación y Desarrollo en Salud – R&D") is scarcely available. For this reason, the only data source is the general budget of the Ministry of Health and Sports for 2002–2006 found at the General Accounting Office of the Republic. This allows us to know the entire expenditures, including the MSD expenditures.

The database of the Accounting Office for years 2002–2006 covers expenditure data classified according to the categories mentioned in Table 3.

The information of such database was processed as follows:

(a) To select the expenditures in R&D of the Ministry of Health.

(b) To obtain the total amount of assigned resources (investment and current cost) according to the item of expenditure of the functional unit.

(c) To obtain the expenses by INLASA, the only institute that incurs in R&D within the expenditure structure of the Ministry.

(d) To estimate resource allocation in R&D in Epidemiology based on the total expenditure of the Ministry[21].

(e) To add both quantities and convert them to PPP (Purchasing Power Parity) with their respective coefficients.

(f) To produce tables with the estimated technical coefficients.

Table 3 presents the variables classifying spending and investment from the Treasury's database. Such data allowed the identification of variables and indicators to create the structure of the database for the study. In this way, in the original base, the expenditure assigned to the Code of the Ministry of Health and Sports was filtered first, so neither

[21] According to the parameters stated by Doctor María Bolivia Rothe, Director of Epidemiology Unit.

expenditure by universities nor by municipal governments was considered. A similar criterion was adopted for the institutes.

In the same way, both current expenses and investments –with the exception of those used to buy equipment, furniture or materials- were considered as expenditures assigned to health. Afterwards, the type of programs developed by each functional unit was verified; emphasizing INLASA and the Epidemiology Unit of the Ministry of Health and Sports. For the year 2006, the adopted projects and their direction, as well as their objectives, were identified. It was possible, then, to corroborate that the projects do not have an exclusive orientation towards biomedical or public health research; rather, their methodology combines both areas. Afterwards, the data supplied by the Epidemiology Unit of the MSD was weighted.

Table 3. Variables Classifying Expenditures in R&D in Health, General Accounting Office of the Republic, 2002-2006

Expenditure Origin	**Source**
Central Administration	Tesoro General de la Nación
Decentralized Institutions	T.G.N. Other resources
Municipalities	Specific Resources
	T.G.N. Transfer
Code Entity	External Donation
Ministerio de Salud y Deportes	
Universidad Mayor Real y Pontificia de San Francisco Xavier	**Economic Clasification**
Universidad Mayor de San Andrés	Consumption Expenditure - Current Goods
Universidad Mayor de San Simón	Consumption Expenditure - NonPersonal Servicies
Universidad Autónoma Tomas Frías	Consumption Expenditure - Taxes
Municipalidad de Poroma	Consumption Expenditure - Taxes and Others
Municipalidad de Sopachuy	…
Municipalidad de Villa Alcalá	GKFF - Machinery and equipment
Municipalidad de Tinguipaya	Own Production - Salaries and Wages
Municipalidad de Carapari	Own Production - Employer Contributions to Social Insurance
	Own Production - Employer Contributions for housing
Funding Agency	…
(Without Funding Agency)	
Tesoro General de la Nación	**Current or Capital Expenditure**
Tesoro General de la Nación - Popular Participation	Current Expenditure
T.G.N. - Impuesto Directo a los Hidrocarburos	Capital Expenditure
Other Specific Resources	
Organización Panamericana de Salud	**Feature Code**
Fondo de las NN.UU. para la Infancia	Research and development: Health
Belgium	
Private Banks	**Program**
Other External Financing Agencies	ADM. CENTRAL - INLASA
	INVESTIGACION Y PRODUCCION EN LABORATORIOS DE SALUD
Category	CENTRO DE INVESTIGACION MAL DE CHAGAS
Perm. Empl. - Basic Assets	INSTITUTO EXPERIMENTAL DE BIOLOGIA
Perm. Empl. Antiquity Bonus - Other Institutions	INSTITUTO DE CANCEROLOGIA
Perm. Empl. Bonuses - Medical Categories	INSTITUTO DE PATOLOGIA
…	INSTITUTO DE MEDICINA NUCLEAR
Water	INSTITUTO DE GENETICA HUMANA
Telephone Services	INST.BOLIV.DE BIOLOG. DE LA ALTURA
House Gas	INSTIT.DE INV. EN SALUD Y DESARROLLO
Internet servicies and others	
…	
Serv.Profesionales y Com. - Medical, Health and Social	
Serv.Profesionales y Com. - Studies and Research	
Serv.Profesionales y Com. - Commissions and bank fees	
Serv.Profesionales y Com. - Laundry, Cleaning and Hygiene	
…	

Source: Information from Contaduría General de la República.

The most important result obtained from the above mentioned procedure was the construction of a technical coefficients matrix[22] that was later applied to the period 2002-2005, and transformed into PPP US dollars. The results of which are summarized in Table 4 that presents the base data for annual estimates.

Table 4. Considerations to estimate expenditure in R&D in Health of the Ministry of Health and Sports

Year	2002	2003	2004	2005	2006
% INLASA	3,89%	2,16%	2,39%	2,19%	4,98%
% Epidemiology	4.35%	4.35%	4.35%	4.35%	4.35%
% of Expenditure in R&D	0.99%	0.78%	0.81%	0.78%	1.12%
Expenditure in R&D from the Ministery (PPP)	1.169.205	1.068.143	1.269.074	1.515.567	1.557.980

Source: Based on information provided by Contaduría General de la República and del Ministerio de Salud y Deportes (Dirección General de Asuntos Administrativos y Unidad de Epidemiología).

4. Results

4.1. Descriptive analysis

4.1.1. Health research

Within the Ministry of Health and Sports the programs[23] that carry out research in health are: National Control of Tuberculosis (Control Nacional de Tuberculosis), Fight Against Great Endemic Diseases (Lucha contra las Grandes Endemias), National System of Health Information (Sistema Nacional de Información en Salud – SNIS), Epidemiologic Shield Program (Programa del Escudo Epidemiológico – EE), Integral Health Project (Proyecto Salud Integral - PROSIN II) and the National Institute of Health Laboratories (Instituto Nacional de Laboratorios de Salud – INLASA). All these programs under the Ministry carry out their activities in different concentrations, both in the area of biomedicine and public health and, within the framework of definitions adopted by the present study, it is possible that one area might include the other and vice-versa. On the other hand, no program of the Ministry carries out clinical research.

Table 5 shows that the greatest concentration of resources of the Ministry assigned to R&D go to the EE (the Epidemiologic Shield) (2.83%), which focuses its activities in the biomedical area – almost 80%- and the rest of its activities are dedicated to public health. Although quite far from the EE, INLASA comes in second place (4,98 %) in share of resources assigned to research and, due to its institutional mandate, it concentrates almost all of its activity to biomedical research. The third in share is PROSIN II (0,60 %) that focuses almost 100% of its activities to public health. The SNIS is the System of Health Information that had the

[22] This technical coefficient matrix has been built considering two approaches; (i) the information from de Ministry of Health and Sports (Epidemiology Unit), information that has been adjusted with (ii)) research shares presented by ANLIS (National Administration of Laboratories and Health Institutes) depending on the Ministry of Health in Argentina. It shows a simple average of 12% as the proportion of the total expenditure devoted to R&D.

[23] Although there are projects, programs, the INLASA is an institute and the Epidemiologic Shield, under responsibility of the Epidemiology Unit, for the purpose of this study all of them are called “programs” in order to avoid confusions when classifying the research sphere according to the method of the research and its objective.

lowest share of expenditures in 2006; given its type, it devotes all its activities to public health.

Table 5. Investment in Health Research according to the Program of the Ministry of Health and Sports - 2006 (In PPP)

Program	Amount	Percentage
Total Expenditure	**16,704,706**	**100%**
Current Expenditure	**15,146,726**	**90.67%**
Investment	**1,557,980**	**9.33%**
Tuberculosis	59,889	0.36%
Major Endemic Diseases	61,681	0.37%
SNIS	31,652	0.19%
Epidemiological Shield	472,872	2.83%
PROSIN II	99,841	0.60%
INLASA	832,044	4.98%

Source: Based on information provided by Ministerio de Salud y Deportes - Unidad de Epidemiología

The research activities of INLASA and EE continuously incorporate the social, economic and cultural characteristics of the country and they traverse studies and research projects. However, to be able to define the direction of the research carried out by both institutions, this research has given higher priority to the ones that study context.

Table 6 describes INLASA and EE annual share of the total expenditure of the Ministry for the period 2002–2006; both concentrate an important percentage of the total amount of investment assigned to research and development. The table corroborates that the Ministry concentrates great part of its energy – and, naturally, resources – in epidemiological control.

Table 6. Research Programs as a share of Total Expenditure of the Ministry of Health and Sports (2002–2006)

Year	Total Expenditure (1)	INLASA	Epidemiology	R&D Expenditure (1)	R&D Expenditure (2)
2002	236.134.275	0,47%	0,52%	2.332.564	1.169.205
2003	284.114.711	0,26%	0,52%	2.218.533	1.068.143
2004	342.860.287	0,29%	0,52%	2.772.927	1.269.074
2005	430.963.551	0,26%	0,52%	3.379.715	1.515.567
2006	337.713.475	0,60%	0,52%	3.779.659	1.557.980

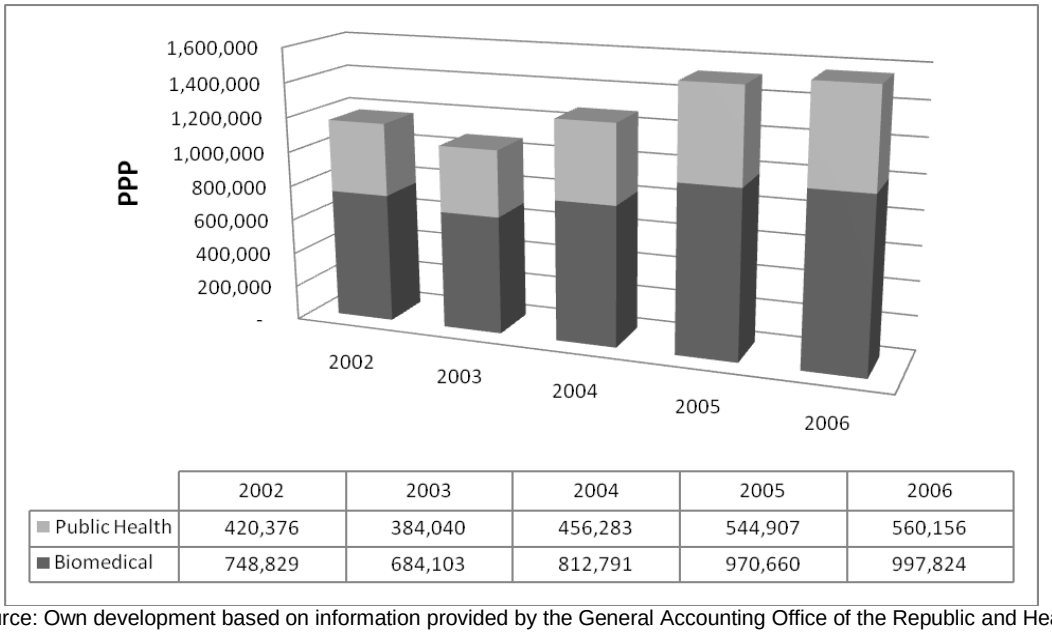
Source: Based on information provided by Contaduría General de la República

(1) In current Bolivianos (Bs.) (2) In PPP.

The annual evolution of resources assigned to research and development in health by the Ministry of Health and Sports, describes the expenditure level for the 2002–2006 period in terms of Purchasing Power Parity [24] (PPP)", a trend that increased until 2006, when the slope was reversed and showed a lower level of resources assigned to R&D for 2006. In the 2005 period, available resources for public investment decreased significantly as a result of the political situation of the country.

Figure 1. Resources assigned to R&D at the Ministry of Health and Sports

[24] The original English expression "Purchasing Power Parity" was used.



	2002	2003	2004	2005	2006
Public Health	420,376	384,040	456,283	544,907	560,156
Biomedical	748,829	684,103	812,791	970,660	997,824

Source: Own development based on information provided by the General Accounting Office of the Republic and Health and Sports (Epidemiology Unit)

These matrices were created applying the technical coefficients from the data provided by the Unit of Epidemiology of the MSD for 2006 regarding the methodology and the objective of the Unit's programs and projects. Additionally, in order to calculate the share of the executed budget devoted to R&D, they were adjusted by technical coefficients provided by ANLIS (National Administration of Laboratories and Health Institutes research in Argentina). Subsequently, the programs and projects were classified in biomedical, clinical or public health research, in accordance with their objectives. Previously, all amounts were converted to "PPP" in the database.

Table 7. Matrix of Technical Coefficients (base: 2006)

				Research Methodology		
			Nº	Biomedical	Clinic	Public Health
Objective	Context	Socioeconomic - Cultural	1	3,06%	0,00%	0,61%
	Problems	Communicable diseases	2	38,95%	0,00%	13,54%
		Non-communicable diseases	3	0,00%	0,00%	0,61%
		Nutrition and environment	4	22,04%	0,00%	4,80%
		Violence and accidents	5	0,00%	0,00%	0,61%
	Actions	Research in Politics, System and Health Servicies	6	0,00%	0,00%	15,77%
		Technological Research and Development	7	0,00%	0,00%	0,00%
		Tradicional Medicine	8	0,00%	0,00%	0,00%

Source: Based on information provided by Unidad de Epidemiología del MSD.

Table (8), presented below, shows annual expenditure for the time period of interest. This information explains the variations in expenditure in relation to the total amount of expenditures of the Ministry of Health and Sports.

It is important to compare the direction in health research to the demand identified in 2007 by the Ministry of Health and Sports, which defined 10 sub-agendas for health research during

the “National Workshop of Leadership in Health Research – October 2007” (“Taller Nacional de Rectoría sobre Investigación en Salud – Octubre 2007”).

This allowed the regrouping of the 16 that were initially identified under criteria such as “violence and accidents” within the subject “health promotion”. Following a similar reasoning, it considered “non-transmittable diseases” to be distributed in various subjects (breast and uterine cancer in “women’s health”, diabetes and other food-related diseases in “nutrition and food safety”, and other non-transmittable diseases in “health promotion”). Also, given current government policy, workshop participants determined that “the health of the excluded population” must be a central axis to be applied to all health research sub-agendas. The 10 sub-agendas in order of priority were:

1. Children’s health
2. Women’s health
3. Health Systems
4. Nutrition and Food Safety
5. Health Promotion
6. Transmittable Diseases
7. Environmental Health
8. Health of Indigenous-Native Peoples
9. Health and Culture: Traditional Medicine
10. Plants with Medicinal Properties: Technological Development and Innovation

Table 8. Classification of the Ministry of Health's programs according to Research Methodology and Objective (in PPP)

			2002			2003			2004			2005			2006		
			Research Methodology			Research			Research			Research			Research		
			Biomedical	Clinic	Public Health	Biomedical	Clinic	Public Health	Biomedical	Clinic	Public Health	Biomedical	Clinic	Public Health	Biomedical	Clinic	Public Health
Objective	Context	Socioeconomic - Cultural	35,801	-	7,191	32,707	-	6,569	38,859	-	7,805	46,407	-	9,321	47,705	-	9,582
	Problems	Communicable diseases	455,37	-	158,264	416,01	-	144,584	494,266	-	171,782	590,268	-	205,147	606,786	-	210,888
		Non-communicable diseases	-	-	7,191	-	-	6,569	-	-	7,805	-	-	9,321	-	-	9,582
		Nutrition and environment	257,658	-	56,145	235,387	-	51,292	279,666	-	60,941	333,986	-	72,778	343,332	-	74,814
		Violence and accidents	-	-	7,191	-	-	6,569	-	-	7,805	-	-	9,321	-	-	9,582
	Actions	Research in Politics, System and Health Servicies	-	-	184,395	-	-	168,457	-	-	200,146	-	-	239,02	-	-	245,709
		Technological Research and Development	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Tradicional Medicine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: Based on information provided by Ministerio de Salud y Deportes

5. The Case of the University Mayor of San Andrés

5.1. Introduction

The University Mayor of San Andrés[25], through its Department of Research, Graduate Studies, and Social Interaction (Departamento de Investigación, Postgrado e Interacción Social - DIPGIS) is the entity in charge of planning, coordinating, advancing, evaluating, and tracking research activities of the institutes and specialized centers under it.

This university, which formally does not held formal links with the described research system, has 37 research institutes in different science areas, under a particular department or college, and have adequate infrastructure, with their own equipment and a group of researchers. In particular, the health area is composed of: i) Research Institute in Health and Development (Instituto de Investigaciones en Salud y Desarrollo – INSAD), ii) Institute of Genetics, iii) Bolivian Institute of High Altitude Biology (Instituto Boliviano de Biología de Altura – IBBA), iv) Institute of Laboratories Services for Diagnosis and Health Research (Institutos de Servicios de Laboratorios de Diagnóstico e Investigaciones en Salud – SELADIS), v) Institute of Research in Pharmacology and Biochemistry and vi) Center for Information and Documentation of Medicine.

The information presented in this report is up to date and official. The sources are the study entitled “The Scientific and Technologic Potential of the University Mayor of San Andrés” (“El Potencial Científico y Tecnológico de la Universidad Mayor de San Andrés”), a document published in 2008 by DIPGIS –with data for the years 2000 to 2006- and the presentations at the “Forum for Debating Scientific Research in Health in Bolivia” (“Foro Debate de la Investigación Científica en Salud en Bolivia”), which took place in September 2008 in the city of La Paz.

Thus, it is important to note that the document published by the UMSA includes plenty of information, which allowed the application of methodological criteria of identification of research methodology and projects objectives. However, data are aggregated in a way that does not allow an analysis per year, for which the conclusions will be presented as an aggregated assessment, chiefly of the priorities in health research within the UMSA.

5.2. Research lines

The different institutes and specialized centers that develop research activities in the health field have different focuses, listed below:

i) Research Institute in Health and Development: biomedical and social.

ii) Institute of Genetics: cytogenetics, toxicological genetics and molecular genetics.

iii) Bolivian Institute of High Altitude Biology: adaptation or non-adaptation to life in high altitude and human biodiversity.

iv) Institute of Laboratories Services for Diagnosis and Health Research: neoplasia, allergies, infectious diseases, autoimmunity, endocrine and metabolic diseases, reference values, clinical histocompatibility, forensic genetics, analysis of finished pharmaceutical formulas and galenic preparations, food control and analysis, toxicological control and analysis in all areas, immunomodulators, biologic activity of natural products, control of environmental pollutants, study of the effects of pesticide,

[25] UMSA – La Paz, Bolivia

metals and other pollutants and their consequence over health (infections-immunology-nutrition-neurology).

v) Institute of Research in Pharmacology and Biochemistry: pharmacological chemistry, pharmacology and microbial biotechnology.

vi) Center for Information and Documentation of Medicine: rational use of pharmaceuticals

5.2.1. Staff classification

Regarding the composition of personnel, in the six health institutions under the College of Pharmacological and Biochemical Sciences and the College of Medicine, Nursing, Nutrition and Medical Technology there are 120 persons dedicated to research and development that represent 17% (687) of the total personnel of the university. Final data show that there are more men (440) than women (247), whereas in health there are more women than men. The comparison by type of personnel shows that 41% are researchers, 21% are research fellows, 21% are technical staff and 17% are support staff (Table 9).

Also, regarding the education profile of the 49 health researchers, the majority has a master and specialty degree (36), and the rest have post doctorate, PhD and bachelor degrees.

Table 9. Human Resources in Health assigned to Research by Staff classification according to Institute or Research Center

Research Institute or/and Centre	Researcher		Fellow R + D		Permanent Staff		Support Staff		Total	
	W	M	W	M	W	M	W	M	W	M
Instituto de Genética	5	4	0	0	4	2	1	1	**10**	**7**
Instituto Boliviano de Biología de Altura	5	5	0	0	13	1	4	4	**22**	**10**
Instituto de Investigación en Salud y Desarrollo	3	6	1	3	4	0	2	0	**10**	**9**
Servicios de Laboratorio de Diagnóstico e Investigación en Salud	12	1	10	4	1	0	3	5	**26**	**10**
Instituto de Investigaciones Fármaco Bioquímicas	3	4	2	5	0	0	0	0	**5**	**9**
Centro de Información y Documentación del Medicamento	1	0	0	0	0	0	1	0	**2**	**0**
TOTAL	**29**	**20**	**13**	**12**	**22**	**3**	**11**	**10**	**75**	**45**

Source: Potencial Científico y Tecnológico from Universidad Mayor de San Andrés, 2006

Table 10. Health Researchers by Level of Education according to Institute or Research Center

Research Institute or/and Centre	Post Doctorate	Ph.D.	Master	Specialist	Licentiate	Total
Instituto de Genética	0	0	8	1	0	9
Instituto Boliviano de Biología de Altura	0	2	0	7	1	10
Instituto de Investigación en Salud y Desarrollo	0	0	8	1	0	9
Servicios de Laboratorio de Diagnóstico e Investigación en Salud	0	1	5	3	4	13
Instituto de Investigaciones Fármaco Bioquímicas	1	4	1	1	0	7
Centro de Información y Documentación del Medicamento	0	0	1	0	0	1
TOTAL	**1**	**7**	**23**	**13**	**5**	**49**

Source: Potencial Científico y Tecnológico from Universidad Mayor de San Andrés, 2006

5.3. Research Projects by Research Methodology

The classification used by the Department of Research, Postgraduate Studies and Social Interaction (Departamento de Investigación, Postgrado e Interacción Social – DIPGIS) for research activities carried out by the Institutes and/or Research Centers consists of:

- Basic Research: experimental or theoretical work that is undertaken mainly to obtain new knowledge about the fundamentals of phenomena or observable facts, without the purpose of any particular application o use.
- Applied Research: these are also original works developed to obtain new knowledge, however it is fundamentally geared towards a specific practical objective
- Experimental Development: these are systematic works that make use of existing knowledge obtained from research and/or practical experience and are directed towards the production of new materials, products or devices; the launching of new processes, systems and services or towards the substantial improvement of existing ones.

According to the project classification used in the publication of UMSA, these projects were assigned to the categories defined as the research objective.

Summary tables follow, with results obtained from a cross analysis of the weight of the projects in each institute according to research methodology. The table underscores the fact that the greatest concentration of projects is found at the Bolivian Institute of High Altitude Biology (Instituto de Biología de la Altura – IBA), where clinical and public health research have higher priority; these two research methodologies, when added, represent 73% of the total of projects.

Within the IBA clinical research, “non-communicable diseases and addictions” are the focus of the most research. In public health research, the Institute of Laboratories Services for Diagnosis and Health Research (Instituto de Servicios de Laboratorio de Diagnóstico e Investigación en Salud) focuses on “nutrition and the environment.”

Table 11. Projects by Institute and Research Methodology

Institute	Projects		METHODOLOGY					
			Biomedical		Clinic		Public Health	
	No.	%	%	Nº Proj.	%	Nº Proj.	%	Nº Proj.
Instituto de Genética	10	11%	10%	9	1%	1	0%	0
Instituto de Biología de la Altura	52	58%	6%	5	29%	26	24%	21
Servicios de Laboratorio de Diagnóstico e Investigación en Salud	21	24%	7%	6	8%	7	9%	8
Instituto de Investigaciones Fármaco Bioquímicas	6	7%	4%	4	2%	2	0%	0
Total	**89**	**100%**	**27%**	**24**	**40%**	**36**	**33%**	**29**

Source: Based on information provided by UMSA.

6. Conclusions

The system of innovation of health in Bolivia is formed by public institutions such as the Ministry of Health and Sports (Ministerio de Salud y Deportes –MSD) and also by institutes belonging to the university system, as can be seen in the case of the UMSA.

As revealed in the present study, it is very complex to perform a fully detailed analysis that enables one to discriminate the number of projects and their methodological orientation, as well as their objective, especially in the case of programs developed by the MDS, since the way the data is recorded does not allow one to disaggregate it. The empirical approximations carried out still describe insufficient elements to conclude whether the expenditures – assigned to research in health given the priorities resulting from the health profile of the country—are adequate or not.

Similarly, more research is required to study the criteria under which the MDS and the UMSA determine their research priorities. The significance of such analysis consists in the need to identify the decision making processes through which health expenditures are directed and, consequently, the way in which the country's priorities in health are fulfilled. It is important to perform this kind of approximations with consideration to the institutes or other entities within the public university system that carry out research in health.

The study highlights the direction of MDS programs regarding its methodology in biomedical research and public health, but the question remains, how does the system of national innovation develop clinical research? In addition, it is critical to include hospitals in the analysis, where – intuitively – this kind of research is carried out. However, it appears clear that clinical research is of high priority for the innovation endeavors of the UMSA institutes. Given the above, the question is: who and how is the information recorded so as to avoid saturation or that the priorities for research expenditure can become balanced, especially regarding its objectives?

In short, it is necessary to reflect on ways and mechanisms that would allow an organized, well-structured operation of the country's innovation system, so that the priorities in expenditure and investment can clearly be orientated in relation to the criteria that allow the verification of such resources truly responding to the health priorities of the country. The coordination between institutions is a critical issue, due to its role in health research, as demonstrated in the present study. Also, the organization of this coordination is another topic to be considered by decision makers.

APPENDIX

Table A.1: Projects by Research Methodology and Objective according to Institute

Institute	Projects		Public Health							
			Context	Problems				Actions		
	No.	%	Socio-economic-cultural	Communicable diseases	Non-communicable diseases	Nutrition and environment	Violence and accidents	Research in Politics, System and Health Servicies	Technological Research and Development	Tradicional Medicine
Instituto de Genética	10	11%	0%	0%	0%	0%	0%	0%	0%	0%
Instituto de Biología de la Altura	52	58%	4%	0%	12%	12%	0%	12%	0%	2%
Servicios de Laboratorio de Diagnóstico e Investigación en Salud	21	24%	0%	5%	10%	24%	0%	0%	0%	0%
Instituto de Investigaciones Fármaco Bioquímicas	6	7%	0%	0%	0%	0%	0%	0%	0%	0%

Institute	Projects		Clinic							
			Context	Problems				Actions		
	No.	%	Socio-economic - cultural	Communicable diseases	Non-communicable diseases	Nutrition and environment	Violence and accidents	Research in Politics, System and Health Servicies	Technological Research and Development	Tradicional Medicine
Instituto de Genética	10	11%	0%	0%	10%	0%	0%	0%	0%	0%
Instituto de Biología de la Altura	52	58%	0%	0%	42%	6%	0%	0%	0%	2%
Servicios de Laboratorio de Diagnóstico e Investigación en Salud	21	24%	0%	10%	10%	14%	0%	0%	0%	0%
Instituto de Investigaciones Fármaco Bioquímicas	6	7%	0%	17%	17%	0%	0%	0%	0%	0%

Institute	Projects		Biomedical							
			Context	Problems				Actions		
	No.	%	Socio-economic-cultural	Communicable diseases	Non-communicable diseases	Nutrition and environment	Violence and accidents	Research in Politics, System and Health Servicies	Technological Research and Development	Tradicional Medicine
Instituto de Genética	10	11%	0%	10%	80%	0%	0%	0%	0%	0%
Instituto de Biología de la Altura	52	58%	0%	0%	8%	2%	0%	0%	0%	56%
Servicios de Laboratorio de Diagnóstico e Investigación en Salud	21	24%	0%	19%	10%	0%	0%	0%	0%	0%
Instituto de Investigaciones Fármaco Bioquímicas	6	7%	0%	50%	17%	0%	0%	0%	0%	0%

Source: Based on information provided by UMSA.

Public Funding of Health Research: The case of Chile[26]

Guillermo R. Paraje[27]

1. Introduction: Economic and Sanitary Context

According to the most recent report on Human Development,[28] Chile ranks 40th and is listed within the group of countries with high human development. Per capita income is 12 thousand dollars at purchasing power parity (PPP). Life expectancy at birth is 78.3 years. While Chile's per capita income qualifies as medium to high according to the classification of the World Bank, life expectancy is the highest in Latin America and one of the highest in the developing world.

Chile has a population of 16.7 million inhabitants (National Statistics Institute), a low rate of growth as well as a quickly ageing population, having undergone a demographic transition. Nearly 40% of the population lives in the Metropolitan Santiago Region, concentrating 47% of the country's GDP (according to the Central Bank of Chile in 2006). The second most important region is Region VIII (Bío-Bío) with somewhat over 10% of the national GDP, followed by Region V (Valparaíso) with 9% of the national GDP.

In regards to Chile's sanitary profile, the most recent Pan-American Health Organization report -***Health in the Americas, 2007-*** indicates that the main causes for mortality in Chile are cardiovascular diseases, followed by neoplasia and thirdly, external reasons related mainly with accidents (in the case of men) and communicable diseases (in the case of women).

Table 1. Chile: Estimated DALYs (in thousands) by cause. Year 2002

Communicable, maternal and perinatal conditions	*233*	*10,7*
Nutritional conditions	*10*	*0,5*
Noncommunicable diseases	*1.002*	*45,8*
Injuries	*276*	*12,6*
Neuropsychiatric conditions	*666*	*30,5*
Total DALYs	**2188**	**100,0**

Source: World Health Organization

Analyzing lost DALYs or Disability Adjusted Life Years in Chile in 2002 (according to World Health Organization data) reveals a similar prospect (see Chart 1). 76% of the DALYs correspond to non-communicable conditions; the three foremost are neuropsychiatric conditions (almost 30% of DALYs correspond to these conditions), neoplasia and cardiovascular illnesses (each 10%). The remaining DALYs are shared among injuries

[26] This work is part of a research project funded by the Global Forum for Health Research. The author is grateful to Daniel Maceira, Delia Sánchez, María Gabriela Paraje and Jorge Sances for their contributions. He also would like to thank Luis Gutiérrez, María Angélica Sánchez, Thierry de Saint-Pierre, Katherine Villarroel, Leonardo Mena and María Soledad Navarrete for their collaboration and appreciates the comments from participants of an Adolfo Ibáñez University workshop and a debate at the Colegio Médico (Medical College) in Chile, where this work was presented. The author is solely responsible for any errors.

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[28] Available at http://hdr.undp.org/en/reports/global/hdr2007-2008 .

caused by accidents and violent causes, as well as communicable illnesses. This shows that the Chile's epidemiological profile is closer to that of the developed world, rather than developing countries.

However, this epidemiologic profile is relatively new. Thanks to intense economic growth, mainly between 1987 and 1998, and relatively successful sanitary and social policies, Chile's sanitary indicators have improved greatly. For instance, from 1983 to 2003, the infant mortality rate fell by more than half (OPS, Health of Americas, 2007). Similar models of rapid improvement in sanitary indicators can be observed in general in maternal and adult health.

2. Public Institutions which Finance Health Research

Although other public entities participate in the design and allocation of funds, the *Comisión Nacional de Investigación Científica y Tecnológica* or CONICYT (National Commission for Scientific and Technological Research) greatly centralizes the management of resources provided by Chile's public system of health financing. Often these organizations form part of CONICYT advisory councils.

2.1. Comisión Nacional de Investigación Científica y Tecnológica – CONICYT (National Commission for Scientific and Technological Research)

Created by Law #16.746 during President Eduardo Frei Montalva's administration in 1968, this organization was initially an entity which advised the president on the planning, promotion and development of research activities in the basic and applied sciences. Funds assigned for its operations came from the National Budget, donations, inheritances as well as its own income. Run by a president named by the Executive Power, CONICYT has a National Council for Scientific and Technological Research (created by Decree 347 in July 1994) which is presided over by the Minister of Education and is made up of representatives from various Ministries (Health, Defense, Economy, Mining Industry, Planning, etc.), in addition to representatives from Universities and several public and private organizations. The sole purpose of this Council is to provide advice.

At present, CONICYT is in charge of allocating resources to train human capital as well as to fund research and technical development projects. CONICYT's scientific policies are accomplished exclusively by managing its funds and numerous programs, some of which focus on specific areas such as the Astronomy Program, the Red Tide Science and Technology Program, and the National Fund for Health Research. However, the bulk of the funds available to CONICYT has no specific assignment per field, at least not explicitly. The largest funds -in terms of volume of resources- CONICYT manages are:

a) Fondo Nacional de Desarrollo Científico y Tecnológico – FONDECYT (National Fund for Scientific and Technological Development).

b) Fondo de Fomento al Desarrollo Científico y Tecnológico – FONDEF (Fund for the Promotion of Scientific and Technological Development).

Combined, these two funds represent 54% of CONICYT's available funds (according to the 2008 budget) and constitute the cornerstone of public funding of research projects (awarded by bidding process).

2.1.1. Fondo Nacional de Desarrollo Científico y Tecnológico – FONDECYT (National Fund for Scientific and Technological Development)

Created in 1981, this is Chile's oldest and most important program which manages awardable funds. Within FONDECYT funds are assigned under the responsibility of two

Superior Councils -a Science Council of four members and a Technological Development Council of six- which define research programs, select projects, assign the resources provided by CONICYT and supervise projects under execution.

These Superior Councils are supported by 23 groups made up of experts from different areas[29] which select project evaluators, analyze their evaluations and propose projects to be financed by the respective Superior Councils, which then either approve or reject them.

The objectives of FONDECYT programs range from financing research and development projects to the education of specialized human resources, among others.

1. Programa Regular de Proyectos de Investigación - FONDECYT Regular Program of Research Projects)

The most important program in terms of the resources it is assigned -and the oldest within FONDECYT- is the Regular Program, whose main objective is to promote basic research. It funds projects of up to four years duration, in every area of knowledge. Amounts awarded may be used to pay for professional fees, trips, a supporting staff and operative and capital expenses. Financed projects are expected to be published in international scientific journals and presented at seminars and congresses. Over 9,000 articles have been published as a result of projects financed by this fund.

2. Regular Competition for Research Initiation

Created in 2006, FONDECYT'S most recent program has the purpose of initiating young researchers -often scientists who have recently completed their PhD- in the national scientific arena. This program funds research projects of a 2- or 3-year duration in all scientific areas.

3. Incentive for International Cooperation

Organized for the first time in 1996, this program seeks to support the execution of certain projects financed by the Regular Program and the Regular Competition for Research Initiation by funding initiatives for international cooperation. These funds are available only once a year and may pay for air travel and accommodation expenses for foreign researchers who make relevant contributions towards the execution of the research project.

4. Post-doctoral

The purpose of this program is to provide funds to help scientists who have recently obtained their PhDs join a national scientific institution or network. The program finances projects to be developed within a period of two years maximum, and which are backed by an institution or a sponsoring researcher. The program covers professional fees, travel and operative expenses.

2.1.2. Fondo de Fomento al Desarrollo Científico y Tecnológico – FONDEF (Fund for the Promotion of Scientific and Technological Development)

CONICYT's second largest fund in terms of assigned resources, FONDEF was created in 1992 to reinforce the capacity for innovation within companies and universities. One of its main objectives is to facilitate the transfer of knowledge and improve the university-company

[29] These groups belong to the following fields: 1) Mathematics; 2) Physics and Astronomy; 3) Biology; 4) Chemistry; 5) Engineering; 6) Medicine; 7) Agriculture, Farming and Forestry; 8) Animal Health and Husbandry; 9) Architecture, Urbanism, Geography and Arts; 10) Juridical and Political Sciences; 11) Economics and Administration; 12) Education; 13) Anthropology and Archeology; 14) Sociology; 15) Linguistics, Literature and Philology; 16) History; 17) Philosophy; y 18) Psychology. Some fields are included in more than one group.

-or researcher-company- link. Unlike FONDECYT, funds within the FONDEF framework tend to finance applied projects, being assigned to institutions -not researchers- which must cover a minimum of one fifth part of the project's total cost.

Eligible for these awardable funds are non-profit organizations which have an explicit objective for research and development and a legal existence of at least five years. These generally include public or private universities, professional institutions, public or private technological and research institutions, corporations and foundations.

Originally, only six specific areas were included within this program: Agriculture, Forestry, Computer Science, Manufacturing, Mining and Commercial Fishing. Three new areas have been added: Energy and Water Management, Education and Health. The latter was incorporated thanks to the creation of the Fondo de Investigación en Salud – FONIS (Fund for Health Research)

1. Fondo Nacional de Investigación en Salud – FONIS (National Fund for Health Research)

Recently created in 2004, the purpose of this fund is to evaluate the sanitary technologies of Chile which are either new or have not yet proven cost-effective. This program targets the research areas of sanitary management, primary attention, and occupational and environmental health, in addition to others established in Chile's 2000-2010 Sanitary Objectives.[30]

FONIS was created in response to a request by the Consejo Nacional de Investigación en Salud – CONIS (National Council for Health Research), a consulting organ which the Ministry of Health created in 2001 by means of Decree 145.[31]

FONIS is co-administrated and co-financed by CONICYT and the Ministry of Health. Three members from each institution sits on the Council. Their responsibility is to choose from a selection of projects (assessed by external evaluators) and award them resources. Costs are covered equally CONICYT and the Ministry of Health. Funded projects typically focus on public health.

In 2004, FONIS funded 25 projects. In 2005 and 2006, the number of awarded projects rose to 31 and 27, respectively.

3. Methodology and Sources of Information

The following analysis is based on the construction of a database of projects financed by CONICYT through its several programs. As expected -and given that the objective of this study is to examine funding for health-related projects- some were not considered (particularly those of FONDEF, such as Astronomy, etc.)

As a result, the projects considered in this study include all FONDECYT projects (Regular, International Cooperation, Junior Researchers, Doctoral and Postdoctoral programs), FONDEF projects related to health and -since 2004- all FONIS projects.

[30] These objectives endeavor to improve the population's sanitary indicators (i.e. maternal and infant mortality), cope with the challenges of an ageing society and unhealthy behavior (such as tobacco consumption, obesity, sedentariness and unsafe sex) and decrease social inequities in health and health access.

[31] CONIS is made up of representatives from the academic world as well as from the medical guild. Its purpose is to decide on the priority of issues related to health research on the agenda as well as to advise the Health Minister on research activities.

Once we received the original data from various CONICYT boards, projects were classified according to field.[32] To this end we used the project title.[33] Our first classification was to determine three "Methodological" areas- Biomedical Research, Clinical Research and Public Health Research. In addition, we considered ten thematic areas, which cut across the methodological areas. They are as follows:

1. Basic science
2. Social, economic and cultural factors
3. Communicable diseases
4. Non-communicable diseases and addictions
5. Nutrition and the environment
6. Violence and accidents
7. Health policy, systems and services
8. Sanitary research and technological development
9. Traditional medicine
10. Mental illness (excluding addictions)

This last area was included (particularly in the case of Chile) after certain relevant actors of science policy expressed interest in measuring the scientific activity in this area. In terms of DALYs, neuropsychiatric conditions represented 26% of DALYs in 2002. They consequently constitute a very important area in the illness profile of the population.

The projects analyzed vary in duration -from under a year to 58 months. For this reason, we annualized the funds awarded. The payment schedule to project executors is regarded as linear (i.e., the same proportion each year) and the payment begins when projects are awarded. In some programs, a project may be awarded funds towards the end of one year, yet it does not start until the following year. Because of the disparity of criteria between different funds as well as within each one, we considered the year the project was actually awarded funds as the starting point.

All cash amounts have been converted to constant dollars based on purchasing power parity (PPP). This makes it possible to compare projects over time and across the different countries included in this study.

In addition, we processed information on the main researchers' gender and age. Ages of the main researchers of FONIS projects were not reported[34] and, in the case of FONDEF, this information was unavailable in roughly one third of the projects. In all cases, we considered the location of headquarters of the institution in charge of executing each project and from where main researchers hailed.

The period analyzed is 2002-2006, but because of the duration of some projects, we included projects that were awarded funds from 1999 through 2006. Thus, projects whose execution began prior to 2002 and which concluded within the period under examination were taken into account. In these cases, we used only annualized amounts for the 2002-2006 period.

[32] The author is especially grateful for the contribution of Doctor María Gabriela Paraje for her help in classifying projects per area.
[33] Some projects were difficult to classify by title. In other cases, the title may give an erroneous impression of what the project entailed. In this sense, this exercise should be taken as statistical, potentially presenting a certain degree of error. The results shown by this study should be considered in light of these observations.
[34] Researchers' ages are not available at FONIS since there are no online application forms for their projects.

The following tables and graphs were created by the author after processing information supplied by FONDECYT, FONDEF and FONIS.

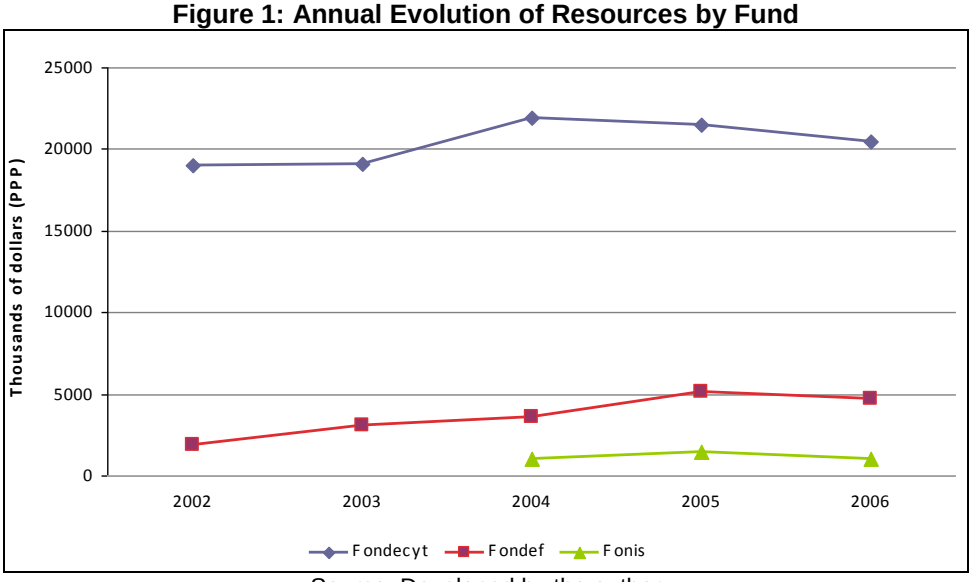
Table 2: Descriptive statistics of database utilized

	FONDECYT	FONDEF	FONIS	TOTAL
Period	2002-2006	2002-2006	2004-2006	-
% Metropolitan Region	80,2	41,0	60,5	76,2
Average age (years)	51,7	50,3	-	51,6
% women in charge of projects	28,5	25,6	50,6	30,7
Average amount of projects (in USD PPP)	157388	473133	44000	161463
Number of projects	648	39	81	768

Source: Developed by the author

Table 2 presents a summary of the awardable funds that were used in this work. We considered 768 projects, 85% of which correspond to FONDECYT projects (in any of the different types), 11% to FONIS projects and the remainder to FONDEF projects. It is precisely these last two which have a higher average amount, nearly 473,000 PPP dollars, whereas FONDECYT averages 157,000 PPP dollars and FONIS averages 44,000 PPP dollars.

Figure 1: Annual Evolution of Resources by Fund



Source: Developed by the author

Figure 1 shows the annual evolution of resources assigned to each Fund. In all three cases, resources increased in real terms. FONDECYT awarded the maximum of resources in 2004, while FONDEF and FONIS did so in 2005. It is observed, however, that the availability of resources from the three Funds for health purposes decreased in real terms in 2006.

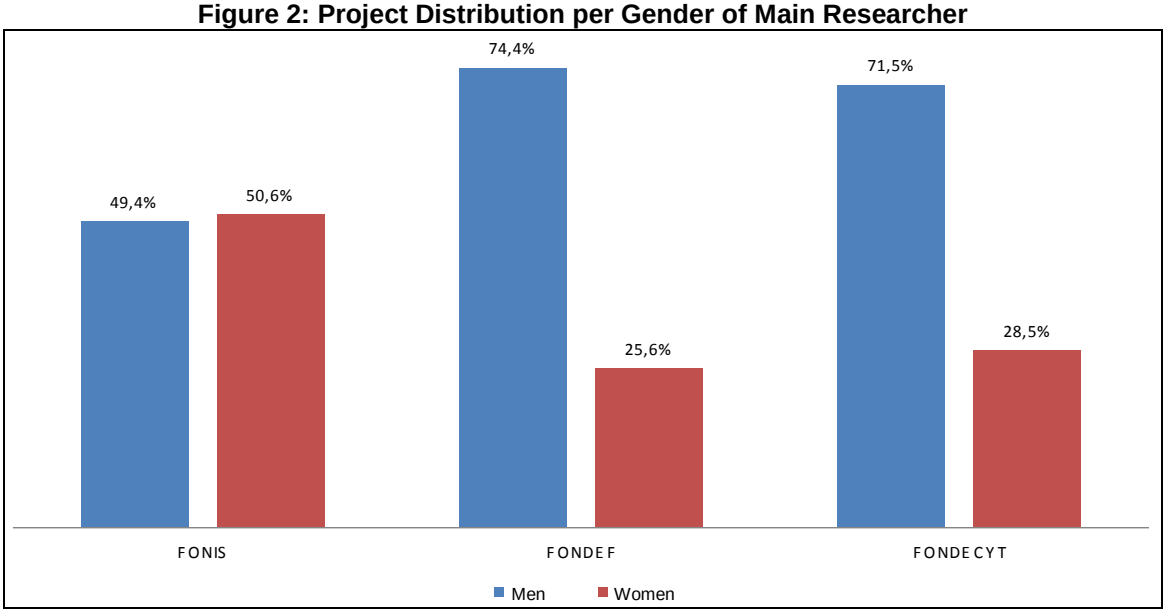
4.1. Health Research according to Researcher's Gender

Figure 2 shows the distribution of projects by main researcher's gender. It is apparent that - except in the case of FONIS, where projects are almost equally distributed between men and women- both FONDECYT and FONDEF have a very high proportion of projects with male researchers (71% - 75%). This data may indicate at least two situations. First, the potential existence of gender discrimination: projects led by male researchers are consciously preferred over similar projects led by women. Secondly, and by no means excluding the first, there may be a greater percentage of male researchers and accordingly, project assignments would reflect these higher figures. Unfortunately, the data available is

insufficient to analyze either of these hypotheses. In order to prove the hypothesis of discrimination, we at least need information on the gender distribution of rejected projects. If the proportion of rejected projects led by women were higher than those led by men, then we would have a strong presumption for discrimination. In any case, some elements within the information available may be analyzed.

The first point to consider is the average cash amount of the projects led by men and women. At FONDECYT, for example, the average project led by men is approximately 157,000 PPP dollars, whereas for women it is 158,000 PPP dollars. At FONIS, the average amount per project is 45,200 PPP dollars for men, whereas, for women, it is 42,800 PPP dollars. Finally, it is FONDEF where the greatest differences are observed: 488,000 PPP dollars for men and 427,000 PPP dollars for women. Nevertheless, all these differences have no statistical significance.

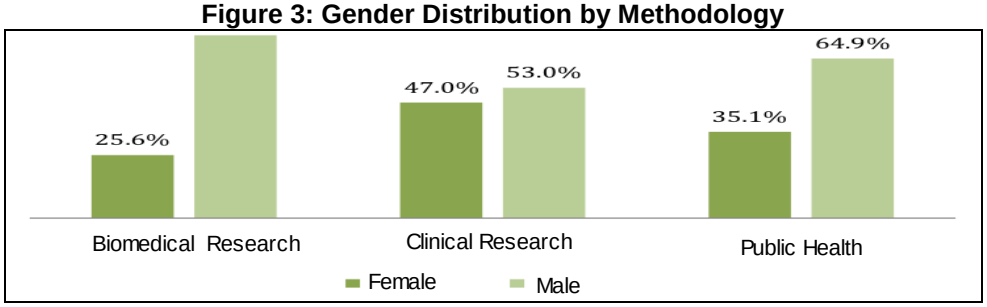
Figure 2: Project Distribution per Gender of Main Researcher



Source: Developed by the author

One possible hypothesis which would explain gender differences in resource allocation is connected with distribution per methodological area. The differences we registered may conceivably be due to the fact that in methodological areas that require greater funding (such as Biomedical Research), there is a disproportionate number of male researchers, whereas in other areas, the ratio is similar. Figure 3 shows that this may not be the case. In all methodological areas, the percentage of male main researchers is higher than that of women, with variations. In biomedical research, the percentage of male main researchers is the highest, nearly three quarters. In Public Health, this percent drops to 65% and, in clinical research -where the numbers are more balanced- men lead only 53% of the projects.

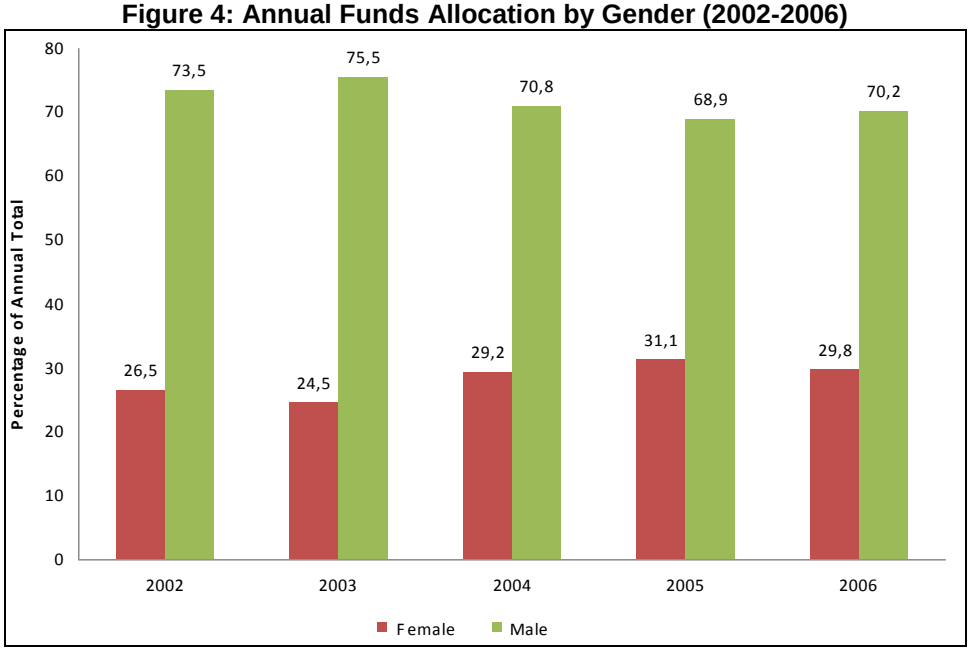
Figure 3: Gender Distribution by Methodology



Source: Developed by the author

Finally, Figure 4 shows the annual distribution of total resources paid by the three funds considered. We may observe that the percentage of women in charge of projects has risen over time (from 26.5% in 2002 to 30% in 2006). Although the period analyzed is too short to consider this a long-term trend, according to the information shown in the chart, we may infer that the current gender imbalance is simply due to a relatively low number of women dedicated to research. This can be expected to change over time.

Figure 4: Annual Funds Allocation by Gender (2002-2006)



Source: Developed by the author

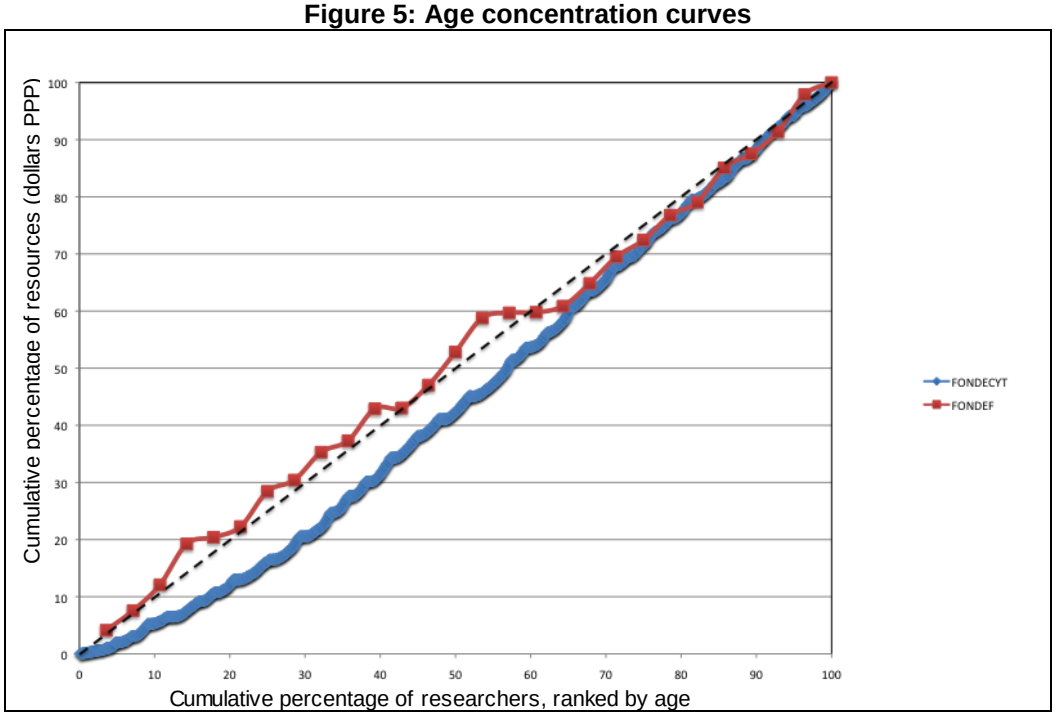
4.2. Age Distribution of Main Researchers

Although data on age is available in projects financed by only two of the funds (FONDECYT and partially FONDEF), we may analyze the age distribution of researchers. A priori, FONDECYT would be believed to be biased towards relatively younger researchers, given its research initiation programs (although less than 3% of the FONDECYT projects we analyzed belong to these programs. As shown in Table 1, the average age within both programs are similar, even though at FONDEF ages range from 41 to 67 years, and at FONDECYT ages range from 32 to 77.

The tool chosen to analyze composition per age in both programs is the concentration curve (shown in Figure 5), since it allows us to consider the distribution of allocated amounts according to main researcher's age. Similar to the Lorenz curve, this curve shows the accumulated percentage of researchers ranked by age (in the abscissa) versus the accumulated percentage of total available resources (in the ordinates). Thus, if the curve falls beneath the straight dotted line -which reflects equal distribution according to age- this indicates resource distribution "biased" towards older researchers, while a curve above the line shows the opposite.

Figure 5 exhibits a concentration curve which is very close to the line of "equal distribution" (dotted line) for the case of FONDEF, indicating the nonexistence of a pattern of resource allocation by age. In fact, after analyzing this concentration curve, it is possible to estimate a concentration index (similar to the Gini coefficient). A zero value for this index (maximum is 1 or -1, according to the concentration pattern) indicates "equal distribution". In the case of FONDEF, this index is 0,01 (practically zero).

Figure 5: Age concentration curves



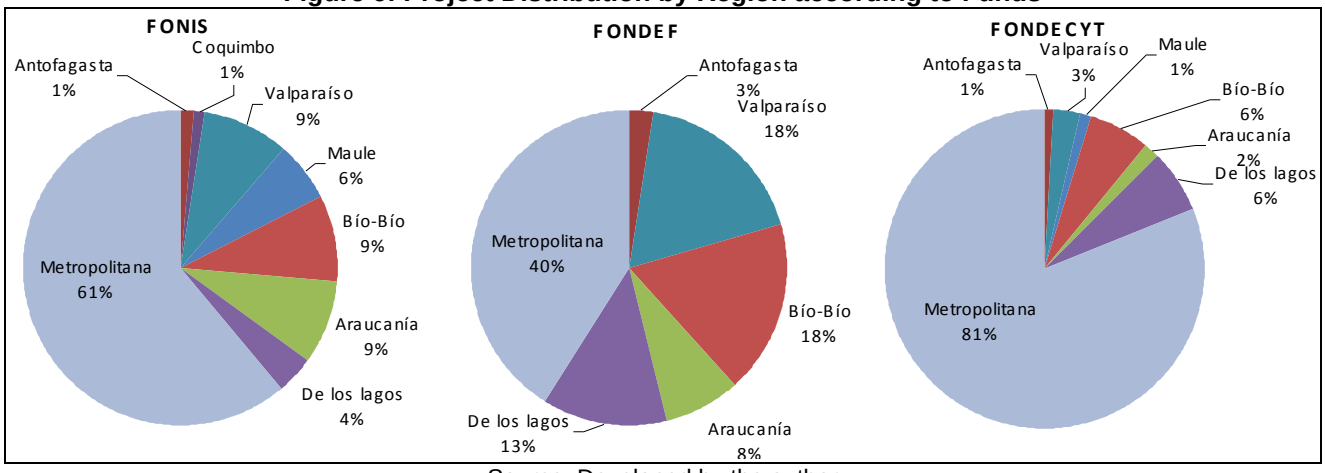
Source: Developed by the author

The concentration index for FONDECYT is 0.11, showing a relatively low bias towards assigning amounts to older researchers. This bias seems insignificant. As showed in Figure 5, it is possibly due to the relatively low amounts which are assigned projects led by younger researchers (under 45 years old), roughly 30% of the total.

4.3. Geographical Distribution of Financed Projects

Figure 6 shows the regional distribution of projects awarded by each of the funds considered, while Figure 7 presents the total awarded amounts for the period. Both charts demonstrate that funds were heavily concentrated in Santiago's Metropolitan Region.

Figure 6: Project Distribution by Region according to Funds

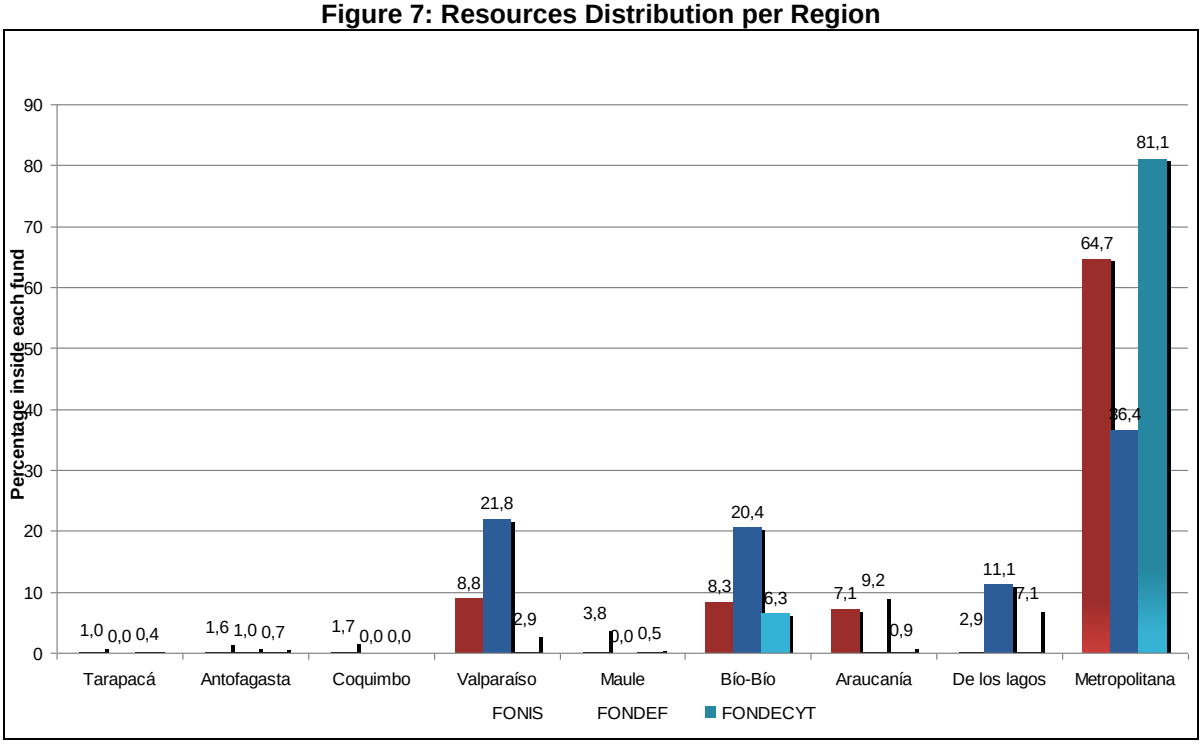


Source: Developed by the author

In the case of FONDECYT, this concentration reached 81%, in both projects (Figure 6) and total amounts assigned by this fund (Figure 7). At FONIS, the Metropolitan Region concentrates 61% of the projects and 65% of the fund's resources. On the other hand, FONDEF is the least concentrated of the funds considered, since 41% of the projects funded

by this program are led by researchers affiliated to the Metropolitan Region. These projects concentrate 36% of FONDEF's total resources.

Figure 7: Resources Distribution per Region



Source: Developed by the author

It is evident that out of Chile's 13 regions, only 9 are represented in the map of health research. Undoubtedly this distribution reflects how important certain institutions of higher education -whose headquarters are located in the Metropolitan Region- are within the country, though all regions have other higher learning institutions and their branches. As a result, this concentration cannot be explained by the absence of institutions capable of participating in the research process.

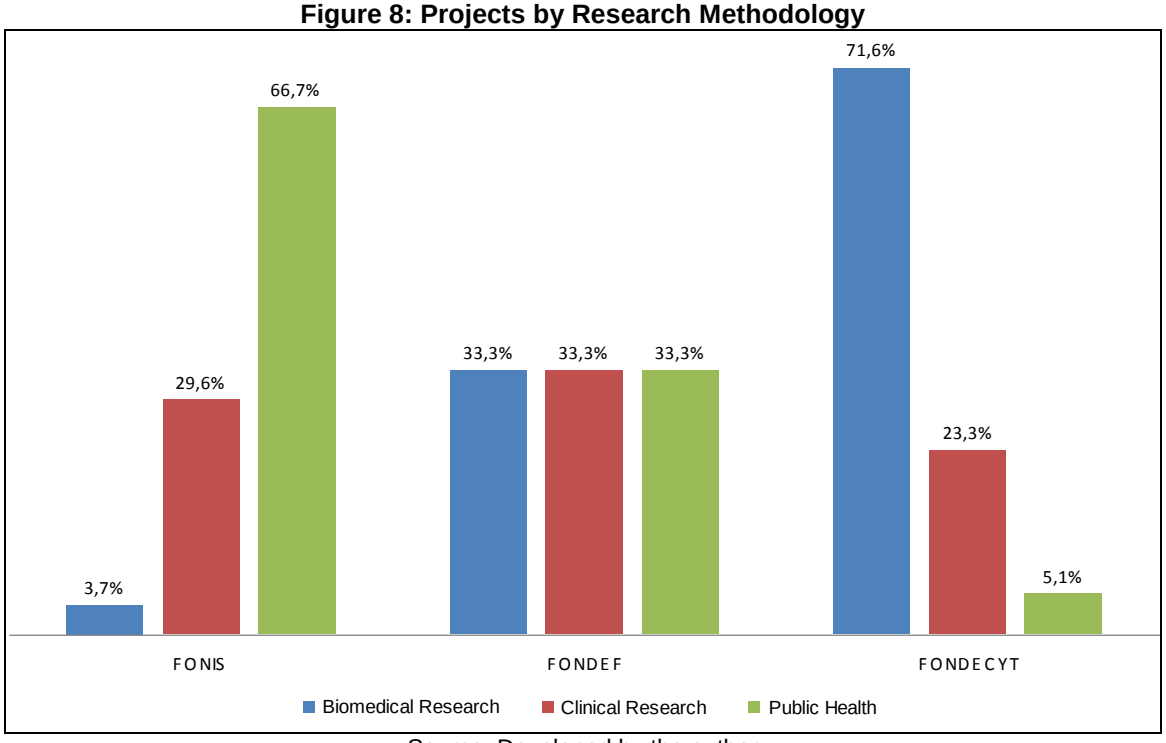
Likewise, the absence of research in some regions cannot be explained by a lack of critical mass, since developing research in some of the areas we considered -such as Health Administration, Health Economics, etc- does not require heavy investment in equipment or a large number of researchers.

4.4. Distribution per Objective/Methodology

As explained in Section 3, we used the titles of funded projects to classify them per research objective and methodology. Figure 8 shows the distribution per methodology of projects that were funded within the framework of each program; Figure 9 shows research objectives.

Figure 8 clearly shows that -at least according to the concept of methodology defined in this study- there is somewhat of a (non-explicit) "specialization" among the funds considered. At FONIS, two-thirds of the financed projects were assigned to public health while biomedical research received a minimum. At FONDECYT the relationship is reversed: 72% of the financed projects belong to biomedical research and only 5% correspond to public health. FONDEF allocates a third of the funds to each of these three areas.

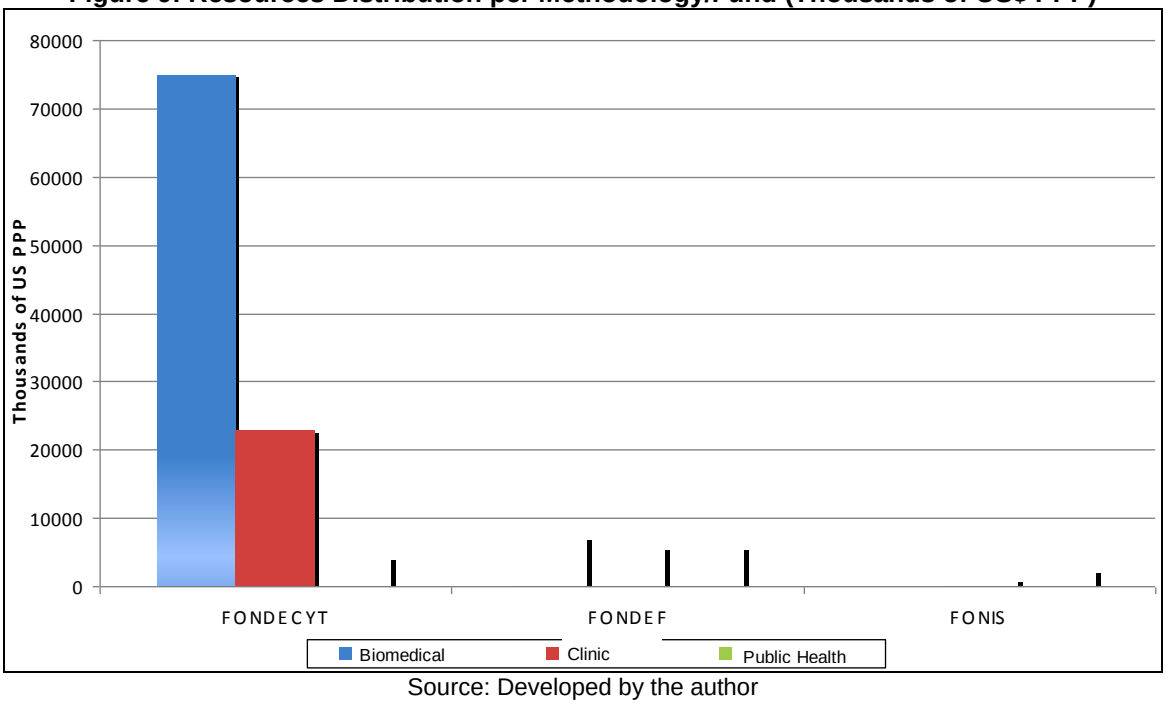
Figure 8: Projects by Research Methodology



Source: Developed by the author

It is important to stress here that the observations above do not imply that the total amounts available for each area coincide. When all three funds are combined, resources available to biomedical research reach 66% of the total, whereas clinical health and public health receive only 24% and 10%, respectively. This is made clear in Figure 9, where it can be seen that - even though "specialization" may exist - in aggregate terms and because each of the funds has dissimilar access to resources, biomedical research is, by far, the most funded area.

Figure 9: Resources Distribution per Methodology/Fund (Thousands of US$ PPP)

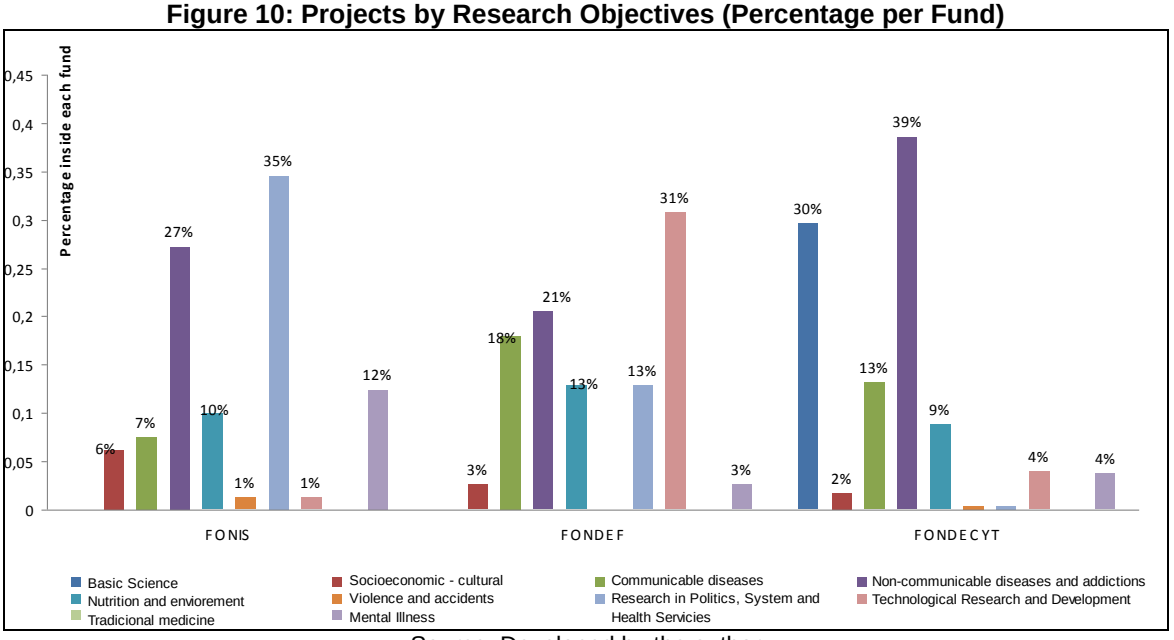


Source: Developed by the author

Figure 10 shows project distribution within each fund according to research objective. Thus, for example, the project area to which FONIS awarded the most funding was health policy,

systems and services- somewhat over one-third of the total projects they financed. The following categories with the most projects funded were non-communicable diseases and addictions (27%), and mental illness (12%). In the case of FONDEF, the areas most frequently awarded resources correspond to technological research and development (31%), followed by non-communicable diseases and addictions (21%) and communicable diseases (18%). Finally, FONDECYT most frequently funded the research areas of non-communicable diseases and addictions (39% of the total), basic science (30%) and communicable diseases (13%).

Figure 10: Projects by Research Objectives (Percentage per Fund)

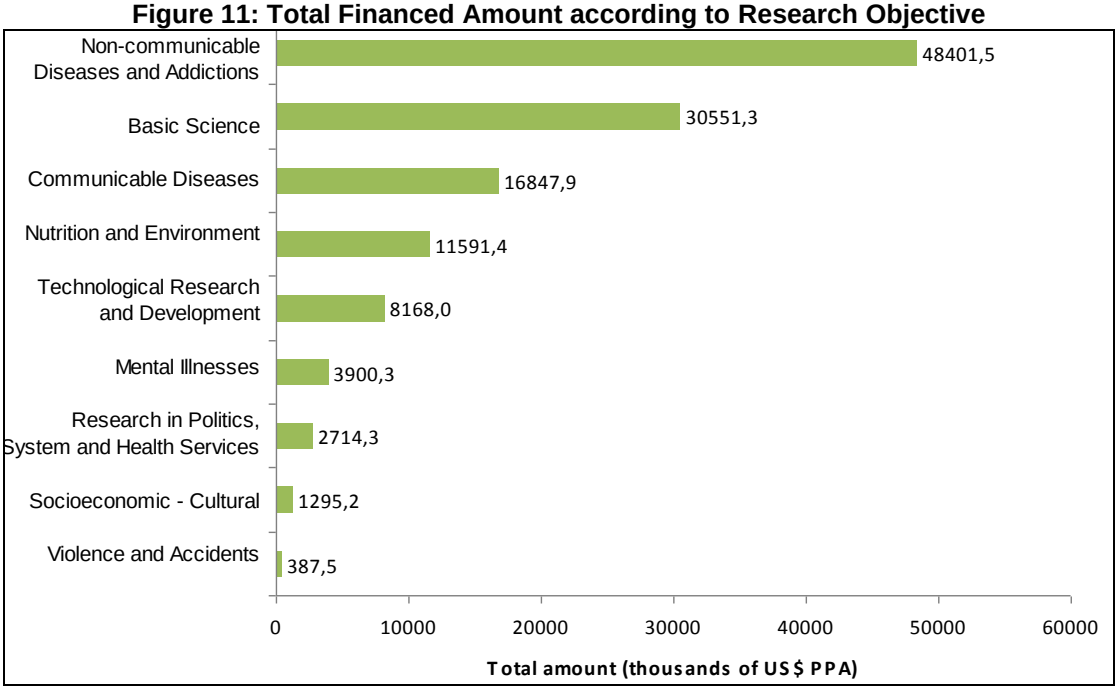


Source: Developed by the author

Again, a certain "specialization" of the funds in research financing is noticeable. Projects which require the acquisition of sophisticated equipment and are oriented towards technological research are covered by FONDEF; this Fund has a strong tendency to link this research to productive activity. In contrast, FONIS is relatively "specialized" in issues of public health, whereas FONDECYT deals with basic research.

In this case, it is also necessary to consider the total amounts allotted to each objective (regardless of which fund had allotted the resources) in order to have an accurate appreciation of the importance of each objective throughout the country. Figure 11 shows that the most funded area was non-communicable diseases and addictions (39% of the total amount), followed by basic science (24%) and communicable diseases (13%). Other objectives which may be deemed important in terms of DALYs -such as research in mental illness or violence and accidents- have relatively low participation: only 3.4% and 0.3%, respectively, over the total amount financed.

Figure 11: Total Financed Amount according to Research Objective



Source: Developed by the author

4.5. What is financed in each Region?

According to the information displayed in Figure 6, it is clear that the distribution of resources among regions is far from equal. The Metropolitan Region captures most of the resources of all the funds available. Yet we are interested in knowing which objectives are most frequently researched in the regions' interior. This aspect is showed in Table 3.

Table 3: Total Amounts per Objective. Distribution Percentage per Region

	Region								
Target	Metropolitan Region	Tarapacá	Antofagasta	Coquimbo	Valparaíso	Maule	Bío-Bío	Araucanía	De los lagos
Basic Science	22,8	6,9	43,6		33,9	53,8	25,7	6,5	41,5
Socioeconomic - Cultural	1,2	7,7					0,3	4,9	
Communicable diseases	14,1		32,0		1,8	9,6	21,9	10,0	9,9
Non-communicable diseases + addictions	43,5	18,2		100,0		29,4	33,0	39,3	36,4
Nutrition and environment	9,4	67,1	5,7		34,4			1,8	
Violence and accidents	0,1				0,6				
Research in Politics, System and Health Services	2,3				0,8		3,3	4,0	1,0
Technological Research and Development	3,5		18,7		28,0		10,4	30,6	11,0
Mental illness	3,2				0,5	7,1	5,4	3,0	0,1
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: Developed by the author

Within the Metropolitan Region, projects which receive greater funding match research in non-communicable diseases and addictions (researchers in this region receive 43% of the total resources) and basic science (23% of the total). Something similar occurs in the Valparaíso Region -34% in both categories- and Bío-Bío -33% and 25% respectively. In these last two regions, projects linked to research and technological development have significant participation -28% in the Valparaíso Region and 10% in Bio-Bio. The Tarapacá Region receives resources mainly in nutrition and the environment (67%), while in Antofagasta, the most financed objective was basic science (44%), as it was in both Maule (54%) and *Región de los Lagos* (42%).

Areas connected to public health or mental illness did not have a significant share in any of the regions. The highest percentage reached by research in mental illness was found in the Maule Region: 7% of total cases.

4. Econometric Analysis

This section includes an econometric analysis in order to investigate possible determinants of the (ex-post) probability of a biomedical research project to obtain financing as compared to other project areas (clinical research and public health). The same procedure is used for research in clinical and public health. We mention ex-post probability because the stage prior to project selection cannot be considered: information on rejected projects and variables that may explain decisions of rejection or approval is not available. Rather, this work considers awarded projects and examines which variables may determine the choice of the methodological area. In each case, the dependent variable is dichotomous and takes the value 1 for projects of the considered area and 0 in the remaining cases.

The independent variables are the variables of funds (FONDECYT was omitted), main researcher's gender (female is omitted), a set of regional dichotomous variables as well as the total amount awarded for each project. For the last variable, we used only projects which started and concluded within the period analyzed, to avoid biasing the results with projects that were incomplete. This reduced the sample from 768 projects to 390: 299 for FONDECYT, 79 for FONIS and 12 for FONDEF. Regressions were estimated using a LOGIT model.

Table 4 shows the results of these exercises. In both biomedical research and public health, the only variables whose coefficients are relevant are the funds' variables. In biomedical research, both FONIS and FONDEF register an exceptionally negative coefficient. This indicates that, ceteris paribus, FONDECYT funds the bulk of projects in this area and has strong statistical importance. A similar situation occurs with Public Health, although in this case with reversed signs: both FONIS and FONDEF have a greater presence than FONDECYT regarding public health (thus its coefficients have positive signs and are relevant). In the case of clinical research, these variables have no statistical importance.

Table 4: Probability (ex-post) of Receiving Financial Support, per Methodological Area

	Biomedical Research			Clinical Research			Public Health Research		
	Coefficient	Standard Error	z Stat.	Coefficient	Standard Error	z Stat.	Coefficient	Standard Error	z Stat.
Gender (ref. woman)	0,272	0,282	0,970	-0,128	0,270	-0,480	-0,161	0,370	-0,430
FONIS	-4,019	0,633	-6,350 *	0,133	0,330	0,410	3,505	0,410	8,460 *
FONDEF	-2,636	0,810	-3,250 *	0,800	0,690	1,160	2,74	0,740	3,700 *
Tarapacá				2,158	1,180	1,830 **	0,238	0,590	0,150
Antofagasta					0,520				
Valparaíso	0,772	0,697	1,110	0,366	0,810	0,700	-1,328	0,760	-1,760
Maule	0,214	0,969	0,220	-0,335	0,440	-0,410	0,166	0,910	0,180
Bio-Bio	-0,711	0,504	-1,410	0,692	0,630	1,580	-0,305	0,650	-0,470
Araucanía	-0,792	0,837	-0,950	0,289	0,760	0,450	0,260	0,760	0,340
Los Lagos	0,800	0,629	1,270	-1,116	0,000	-1,480	0,180	0,730	0,250
Total Amount (thousands US$ PPP)	0,001	0,001	1,500	-0,001	0,280	-1,430	0,000	0,000	-0,240
Constant	0,557	0,284	1,960 *	-0,982		-3,480 *	-2,619	0,420	-6,180 *
Number of obs	384			388			388		
LR chi2(11)	149,7 *			16,3 **			134,8 *		
Pseudo R2	0,286			0,038			0,359		

* Significant at 95% - ** Significant at 90%
Source: Developed by the author

The gender variable has no importance in any of the three funds, indicating that the researcher's gender does not explain the (ex-post) assignment of projects per area. Likewise, regional variables are not relevant (except for Tarapacá in clinical research). Nor

does region explain the assignment of projects per methodological area. Finally, cash amounts for each project does not seem to explain this distribution among methodological areas. In all cases, coefficients were irrelevant.

5. Conclusions

The analysis of Chile's health research projects financed by awardable public funds from 2002-2006 brings to light a series of interesting points which may be considered in order to evaluate how the Funds in charge of administrating resources operate.

The first point is that the Funds have no explicit mechanisms for setting priorities -and for coordination among them- even though they all work under the guidelines of the same institution (CONICYT). However, due to each fund's allocation criteria, this does not mean that there is no "implicit" priority-setting process by which a "specialization" may be created. For example, FONDECYT allocates resources to all objectives considered but with an emphasis on basic science and non-communicable diseases. One of the possible reasons is that upon evaluating the main researchers' backgrounds prior to deciding to fund a project, it considers articles published in international magazines (e.g., those indexed in Thomson ISI's Web of Science). The choice of subject and the availability of magazines impose some restrictions: it is somewhat easier to have an article published in basic science than, say public health. Conversely, FONIS funds projects that have a sanitary impact according to the Health Ministry's sanitary objectives. This produces an evident bias towards projects in Public Health. It may be more efficient for researchers –and signals would be clearer- if the funds had specific areas for financing (with the difficulties that defining areas in health research entails).

The second point to consider is connected to the distribution of projects by gender. Except for FONIS, the percentage of projects led by men is significantly higher than those led by women. This does not mean (at least it cannot be proven in this study) that female researchers are discriminated against. This result may replicate the percentage of the female population dedicated to research (which can be reverted over time, tending towards similar results to those of countries with similar levels of development). Another possible explanation is that areas where women compete on equal terms with men tend to receive insufficient funding.

The third point is the heavy concentration of research activity at Metropolitan Region institutions. Many regions in the country did not get one single health research project funded during the five years analyzed. Certainly this replicates the regional distribution of institutions and researchers. However, if the purpose is to use scientific research as a tool for regional development, it seems that greater incentives should be given for the development of scientific communities in the regions. Allotting resources for research activities may not be the best tool for this purpose; rather it should be a part of a more integral strategy to draw researchers to the country's interior.

Finally, it was observed that the participation of funded areas imperfectly reflects the country's sanitary profile. Some areas -such as mental illnesses or violence and accidents- seem to receive fewer resources than they should when considering their impact on the populations' health. This is not to say that there is a bias against this type of research (one explanation is that the scientific community has little interest in researching these issues), but it is remarkable that Chile lacks special funds to promote knowledge building in these areas.

STATISTIC APPENDIX

Below are a series of tables -organized per year and per fund- which show project distribution per gender of main researcher, information on main researchers' mean age and percentage of main researchers executing projects at institutions located in the Metropolitan Region. All of them include information related to projects executed in each year, regardless of whether they were awarded during that year or earlier. For this reason, information on some of the projects (those that span more than one year) is mentioned in several annual tables.

In all the tables, a scale of 1-30 is used to present project areas, as follows:

1. Biomedical research; basic science
2. Biomedical research; social, economic and cultural factors
3. Biomedical research; communicable diseases
4. Biomedical research; non-communicable diseases and addictions
5. Biomedical research; nutrition and the environment
6. Biomedical research; violence and accidents
7. Biomedical research; health policy, systems and services
8. Biomedical research; sanitary research and technological development
9. Biomedical research; traditional medicine
10. Biomedical research; mental illness
11. Clinical research; basic science
12. Clinical research; social, economic and cultural factors
13. Clinical research; communicable diseases
14. Clinical research; non-communicable diseases and addictions
15. Clinical research; nutrition and the environment
16. Clinical research; violence and accidents
17. Clinical research; health policy, systems and services
18. Clinical research; sanitary research and technological research
19. Clinical research; traditional medicine
20. Clinical research; mental illness
21. Public health research; basic science
22. Public health research; social, economic, and cultural factors
23. Public health research; communicable diseases
24. Public health research; non-communicable diseases and addictions
25. Public health research; nutrition and the environment
26. Public health research; violence and accidents
27. Public health research; health policy, systems and services
28. Public health research; sanitary research and technological development
29. Public health research; traditional medicine
30. Public health research; mental illness

Some of these areas considered were actually rarely observed. For example, Area 21 (research in public health, basic science) was practically impossible to find. Having taken into account these limitations, we nevertheless opted to keep this classification for methodological reasons.

Table A.1. Annual Distribution of Projects FONDECYT

	2002		2003		2004		2005		2006		TOTAL	
Area	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)
1	81	5712,4	81	6.320,5	91	6.980,4	80	6.290,8	80	5.508,8	413	30.813,0
2	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
3	26	1698,8	18	1.314,6	17	1.248,1	20	1.530,5	25	1.643,7	106	7.435,7
4	69	5813,1	72	5.916,0	76	6.179,6	71	5.912,5	73	5.548,2	361	29.369,3
5	6	406,0	11	664,9	11	963,0	14	1.028,8	13	1.118,3	55	4.181,1
6	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
7	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
8	3	284,6	3	253,5	3	241,5	6	394,5	11	462,3	26	1.636,5
9	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
10	3	214,5	4	317,3	5	391,9	5	369,6	2	174,4	19	1.467,6
11	1	82,1	0	0,0	1	73,1	1	69,8	1	64,4	4	289,4
12	4	101,5	3	130,9	5	170,6	3	83,9	0	0,0	15	486,9
13	4	390,1	3	294,3	7	661,5	9	833,3	10	866,7	33	3.045,9
14	29	2.365,1	28	2.416,3	34	2.782,0	35	2.953,7	35	2.615,3	161	13.132,4
15	9	777,1	4	319,0	9	859,8	11	903,1	16	1.140,4	49	3.999,5
16	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
17	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
18	3	196,6	3	181,9	5	202,7	2	111,9	4	128,8	17	821,9
19	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
20	5	204,6	5	173,9	5	258,9	5	273,9	5	195,6	25	1.106,9
21	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
22	1	39,7	0	0,0	0	0,0	1	37,1	1	32,2	3	109,0
23	5	455,3	5	418,8	5	524,0	4	395,8	6	542,0	25	2.335,9
24	1	118,4	2	173,7	3	187,0	2	178,9	2	214,1	10	872,1
25	2	140,1	1	96,0	0	0,0	2	99,6	3	162,9	8	498,6
26	0	0,0	2	53,5	1	45,6	0	0,0	0	0,0	3	99,1
27	0	0,0	0	0,0	1	34,2	1	32,7	2	34,9	4	101,7
28	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
29	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
30	0	0,0	2	85,7	2	81,7	0	0,0	1	17,7	5	185,1
TOTAL	252	18.999,9	247	19.130,9	281	21.885,6	272	21.500,6	290	20.470,7	1342	101.987,7

Source: Developed by the author Note: In all cases USD are PPP

Table A.2. Annual Distribution of Projects FONDEF

	2002		2003		2004		2005		2006		TOTAL	
Area	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)
1	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
2	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
3	0	0	1	239,9	2	506,8	4	1.010,1	4	932,9	11	2.689,8
4	0	0	1	340,8	1	324,6	2	408,4	2	316,9	6	1.390,6
5	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
6	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
7	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
8	1	275,8	1	265,3	3	501,3	4	800,0	5	1.076,0	14	2.918,4
9	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
10	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
11	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
12	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
13	0	0,0	0	0,0	0	0,0	1	321,1	1	296,5	2	617,6
14	0	0,0	1	233,9	3	681,7	4	799,0	4	688,8	12	2.403,5
15	0	0,0	0	0,0	0	0,0	1	18,0	0	0,0	1	18,0
16	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
17	1	13,4	1	98,9	1	47,1	0	0,0	0	0,0	3	159,4
18	3	560,4	5	808,3	4	538,9	3	396,3	2	293,3	17	2.597,2
19	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
20	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
21	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
22	1	419,7	1	33,6	0	0,0	0	0,0	0	0,0	2	453,4
23	1	17,3	1	159,2	1	151,7	1	144,9	1	66,9	5	540,1
24	0	0,0	0	0,0	0	0,0	0	0,0	1	121,1	1	121,1
25	1	164,6	2	467,9	2	445,8	3	704,3	2	642,1	10	2.424,7
26	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
27	1	353,6	1	85,0	1	113,1	2	392,7	2	312,8	7	1.257,2
28	1	117,5	1	113,0	1	107,6	1	60,0	0	0,0	4	398,0
29	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
30	0	0,0	1	212,5	1	202,5	1	48,3	0	0,0	3	463,3
TOTAL	10	1.922,4	17	3.058,4	20	3.621,1	27	5.103,1	24	4.747,3	98	18.452,2

Source: Developed by the author Note: In all cases USD are PPP

Table A.3. Annual Distribution of Projects FONIS

	2002		2003		2004		2005		2006		TOTAL	
Area	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)	No. Projects	USD (thousands)
1	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
2	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
3	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
4	0	0	0	0,0	0	0,0	0	0,0	2	99,8	2	99,8
5	0	0	0	0,0	1	59,3	0	0,0	0	0,0	1	59,3
6	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
7	0	0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
8	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
9	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
10	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
11	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
12	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
13	0	0,0	0	0,0	1	39,8	3	98,8	2	76,8	6	215,4
14	0	0,0	0	0,0	5	217,8	4	181,8	3	91,2	12	490,8
15	0	0,0	0	0,0	2	75,3	1	22,0	0	0,0	3	97,3
16	0	0,0	0	0,0	0	0,0	0	0,0	1	42,1	1	42,1
17	0	0,0	0	0,0	1	29,1	1	27,8	0	0,0	2	56,8
18	0	0,0	0	0,0	0	0,0	0	0,0	1	49,0	1	49,0
19	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
20	0	0,0	0	0,0	0	0,0	2	36,2	1	36,6	3	72,8
21	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
22	0	0,0	0	0,0	1	58,1	3	132,6	1	55,1	5	245,9
23	0	0,0	0	0,0	0	0,0	1	49,5	0	0,0	1	49,5
24	0	0,0	0	0,0	3	117,5	4	159,0	3	86,1	10	362,5
25	0	0,0	0	0,0	1	58,5	4	217,2	0	0,0	5	275,8
26	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
27	0	0,0	0	0,0	6	252,2	12	434,9	13	416,1	31	1.103,3
28	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
29	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0	0	0,0
30	0	0,0	0	0,0	4	160,0	3	84,1	3	99,5	10	343,6
TOTAL	0	0,0	0	0,0	25	1.067,8	38	1.443,9	30	1.052,3	93	3.563,9

Source: Developed by the author Note: In all cases USD are PPP

Table A.4. Projects FONDECYT by Area, Year 2002

	Year 2002					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	81	32,1	5712,4	25,9	48,0	70,4
2	0	0,0	0,0	-	-	-
3	26	10,3	1698,8	19,2	54,0	80,8
4	69	27,4	5813,1	21,7	52,0	87,0
5	6	2,4	406,0	33,3	63,5	100,0
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	3	1,2	284,6	0,0	57,0	66,7
9	0	0,0	0,0	-	-	-
10	3	1,2	214,5	33,3	51,0	100,0
11	1	0,4	82,1	0,0	64,0	100,0
12	4	1,6	101,5	0,0	45,5	100,0
13	4	1,6	390,1	50,0	51,0	50,0
14	29	11,5	2365,1	37,9	54,0	86,2
15	9	3,6	777,1	22,2	55,0	100,0
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	3	1,2	196,6	0,0	63,0	100,0
19	0	0,0	0,0	-	-	-
20	5	2,0	204,6	40,0	55,0	60,0
21	0	0,0	0,0	-	-	-
22	1	0,4	39,7	100,0	59,0	100,0
23	5	2,0	455,3	80,0	56,0	100,0
24	1	0,4	118,4	0,0	46,0	100,0
25	2	0,8	140,1	50,0	52,5	100,0
26	0	0,0	0,0	-	-	-
27	0	0,0	0,0	-	-	-
28	0	0,0	0,0	-	-	-
29	0	0,0	0,0	-	-	-
30	0	0,0	0,0	-	-	-
TOTAL	252	100,0	18999,9	26,6	52,0	81,3

Source: Developed by the author Note: In all cases USD are PPP

Table A.5. Projects FONDECYT by Area, Year 2003

	Year 2003					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	81	32,8	6320,5	21,0	50,0	67,9
2	0	0,0	0,0	-	-	-
3	18	7,3	1314,6	22,2	54,0	88,9
4	72	29,1	5916,0	23,6	52,0	87,5
5	11	4,5	664,9	27,3	50,0	100,0
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	3	1,2	253,5	0,0	44,0	66,7
9	0	0,0	0,0	-	-	-
10	4	1,6	317,3	25,0	53,0	100,0
11	0	0,0	0,0	-	-	-
12	3	1,2	130,9	0,0	43,0	100,0
13	3	1,2	294,3	66,7	51,0	66,7
14	28	11,3	2416,3	35,7	55,5	89,3
15	4	1,6	319,0	25,0	57,5	100,0
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	3	1,2	181,9	0,0	49,0	100,0
19	0	0,0	0,0	-	-	-
20	5	2,0	173,9	60,0	52,0	60,0
21	0	0,0	0,0	-	-	-
22	0	0,0	0,0	-	-	-
23	5	2,0	418,8	40,0	56,0	80,0
24	2	0,8	173,7	0,0	44,0	100,0
25	1	0,4	96,0	100,0	51,0	100,0
26	2	0,8	53,5	0,0	41,0	100,0
27	0	0,0	0,0	-	-	-
28	0	0,0	0,0	-	-	-
29	0	0,0	0,0	-	-	-
30	2	0,8	85,7	100,0	49,5	50,0
TOTAL	247	100,0	19130,9	25,5	52,0	81,4

Source: Developed by the author Note: In all cases USD are PPP

Table A.6. Projects FONDECYT by Area, Year 2004

	Year 2004					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	91	32,4	6980,4	24,2	52,0	70,3
2	0	0,0	0,0	-	-	-
3	17	6,0	1248,1	35,3	56,0	94,1
4	76	27,0	6179,6	23,7	51,0	85,5
5	11	3,9	963,0	45,5	56,0	100,0
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	3	1,1	241,5	0,0	44,0	66,7
9	0	0,0	0,0	-	-	-
10	5	1,8	391,9	60,0	51,0	100,0
11	1	0,4	73,1	0,0	73,0	100,0
12	5	1,8	170,6	0,0	43,0	80,0
13	7	2,5	661,5	42,9	51,0	71,4
14	34	12,1	2782,0	38,2	53,5	85,3
15	9	3,2	859,8	33,3	57,0	88,9
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	5	1,8	202,7	0,0	49,0	100,0
19	0	0,0	0,0	-	-	-
20	5	1,8	258,9	80,0	44,0	100,0
21	0	0,0	0,0	-	-	-
22	0	0,0	0,0	-	-	-
23	5	1,8	524,0	40,0	49,0	80,0
24	3	1,1	187,0	0,0	43,0	100,0
25	0	0,0	0,0	-	-	-
26	1	0,4	45,6	0,0	41,0	100,0
27	1	0,4	34,2	100,0	39,0	100,0
28	0	0,0	0,0	-	-	-
29	0	0,0	0,0	-	-	-
30	2	0,7	81,7	100,0	49,5	50,0
TOTAL	281	100,0	21885,6	29,2	52,0	81,9

Source: Developed by the author Note: In all cases USD are PPP

Table A.7. Projects FONDECYT by Area, Year 2005

	Year 2005					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	80	29,4	6290,8	25,0	51,5	61,3
2	0	0,0	0,0	-	-	-
3	20	7,4	1530,5	25,0	56,0	90,0
4	71	26,1	5912,5	31,0	48,0	81,7
5	14	5,1	1028,8	57,1	52,5	92,9
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	6	2,2	394,5	16,7	53,0	83,3
9	0	0,0	0,0	-	-	-
10	5	1,8	369,6	60,0	51,0	100,0
11	1	0,4	69,8	0,0	73,0	100,0
12	3	1,1	83,9	0,0	59,0	33,3
13	9	3,3	833,3	33,3	51,0	88,9
14	35	12,9	2953,7	37,1	53,0	82,9
15	11	4,0	903,1	36,4	60,0	81,8
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	2	0,7	111,9	0,0	46,5	50,0
19	0	0,0	0,0	-	-	-
20	5	1,8	273,9	60,0	50,0	100,0
21	0	0,0	0,0	-	-	-
22	1	0,4	37,1	0,0	37,0	100,0
23	4	1,5	395,8	50,0	49,5	75,0
24	2	0,7	178,9	0,0	44,0	100,0
25	2	0,7	99,6	0,0	52,0	100,0
26	0	0,0	0,0	-	-	-
27	1	0,4	32,7	100,0	39,0	100,0
28	0	0,0	0,0	-	-	-
29	0	0,0	0,0	-	-	-
30	0	0,0	0,0	-	-	-
TOTAL	272	93,8	21500,6	31,3	52,0	77,6

Source: Developed by the author Note: In all cases USD are PPP

Table A.8. Projects FONDECYT by Area, Year 2006

	Year 2006					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	80	27,6	5508,8	20,0	50,5	62,5
2	0	0,0	0,0	-	-	-
3	25	8,6	1643,7	32,0	55,0	88,0
4	73	25,2	5548,2	31,5	46,0	83,6
5	13	4,5	1118,3	46,2	53,0	92,3
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	11	3,8	462,3	9,1	49,0	90,9
9	0	0,0	0,0	-	-	-
10	2	0,7	174,4	50,0	51,0	100,0
11	1	0,3	64,4	0,0	73,0	100,0
12	0	0,0	0,0	-	-	-
13	10	3,4	866,7	40,0	51,5	90,0
14	35	12,1	2615,3	34,3	52,0	80,0
15	16	5,5	1140,4	37,5	56,5	87,5
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	4	1,4	128,8	25,0	43,0	50,0
19	0	0,0	0,0	-	-	-
20	5	1,7	195,6	60,0	52,0	100,0
21	0	0,0	0,0	-	-	-
22	1	0,3	32,2	100,0	54,0	0,0
23	6	2,1	542,0	33,3	45,5	100,0
24	2	0,7	214,1	50,0	53,0	100,0
25	3	1,0	162,9	0,0	54,0	100,0
26	0	0,0	0,0	-	-	-
27	2	0,7	34,9	100,0	39,0	100,0
28	0	0,0	0,0	-	-	-
29	0	0,0	0,0	-	-	-
30	1	0,3	17,7	0,0	40,0	0,0
TOTAL	290	100,0	20470,7	30,0	50,0	79,0

Source: Developed by the author Note: In all cases USD are PPP

Table A.9. Projects FONDEF by Area, Year 2002

	Year 2002					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	-	-	-
2	0	0,0	0,0	-	-	-
3	0	0,0	0,0	-	-	-
4	0	0,0	0,0	-	-	-
5	0	0,0	0,0	-	-	-
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	1	10,0	275,8	100,0	41,0	0,0
9	0	0,0	0,0	-	-	-
10	0	0,0	0,0	-	-	-
11	0	0,0	0,0	-	-	-
12	0	0,0	0,0	-	-	-
13	0	0,0	0,0	-	-	-
14	0	0,0	0,0	-	-	-
15	0	0,0	0,0	-	-	-
16	0	0,0	0,0	-	-	-
17	1	10,0	13,4	100,0	53,0	100,0
18	3	30,0	560,4	0,0	57,0	33,3
19	0	0,0	0,0	-	-	-
20	0	0,0	0,0	-	-	-
21	0	0,0	0,0	-	-	-
22	1	10,0	419,7	0,0	-	100,0
23	1	10,0	17,3	0,0	-	0,0
24	0	0,0	0,0	-	-	-
25	1	10,0	164,6	100,0	55,0	0,0
26	0	0,0	0,0	-	-	-
27	1	10,0	353,6	0,0	-	100,0
28	1	10,0	117,5	0,0	-	0,0
29	0	0,0	0,0	-	-	-
30	0	0,0	0,0	-	-	-
TOTAL	10	100,0	1922,4	30,0	56,0	40,0

Source: Developed by the author Note: In all cases USD are PPP

Table A.10. Projects FONDEF by Area, Year 2003

	Year 2003					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	-	-	-
2	0	0,0	0,0	-	-	-
3	1	5,9	239,9	0,0	62,0	100,0
4	1	5,9	340,8	0,0	42,0	100,0
5	0	0,0	0,0	-	-	-
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	1	5,9	265,3	100,0	41,0	0,0
9	0	0,0	0,0	-	-	-
10	0	0,0	0,0	-	-	-
11	0	0,0	0,0	-	-	-
12	0	0,0	0,0	-	-	-
13	0	0,0	0,0	-	-	-
14	1	5,9	233,9	0,0	60,0	0,0
15	0	0,0	0,0	-	-	-
16	0	0,0	0,0	-	-	-
17	1	5,9	98,9	100,0	53,0	100,0
18	5	29,4	808,3	0,0	58,5	20,0
19	0	0,0	0,0	-	-	-
20	0	0,0	0,0	-	-	-
21	0	0,0	0,0	-	-	-
22	1	5,9	33,6	0,0	-	100,0
23	1	5,9	159,2	0,0	-	0,0
24	0	0,0	0,0	-	-	-
25	2	11,8	467,9	50,0	49,5	0,0
26	0	0,0	0,0	-	-	-
27	1	5,9	85,0	0,0	-	100,0
28	1	5,9	113,0	0,0	-	0,0
29	0	0,0	0,0	-	-	-
30	1	5,9	212,5	0,0	-	0,0
TOTAL	17	100,0	3058,4	17,6	57,0	35,3

Source: Developed by the author Note: In all cases USD are PPP

Table A.11. Projects FONDEF by Area, Year 2004

	Year 2004					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	-	-	-
2	0	0,0	0,0	-	-	-
3	2	10,0	506,8	50,0	54,5	50,0
4	1	5,0	324,6	0,0	42,0	100,0
5	0	0,0	0,0	-	-	-
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	3	15,0	501,3	33,3	46,0	33,3
9	0	0,0	0,0	-	-	-
10	0	0,0	0,0	-	-	-
11	0	0,0	0,0	-	-	-
12	0	0,0	0,0	-	-	-
13	0	0,0	0,0	-	-	-
14	3	15,0	681,7	33,3	56,0	0,0
15	0	0,0	0,0	-	-	-
16	0	0,0	0,0	-	-	-
17	1	5,0	47,1	100,0	53,0	100,0
18	4	20,0	538,9	0,0	57,0	100,0
19	0	0,0	0,0	-	-	-
20	0	0,0	0,0	-	-	-
21	0	0,0	0,0	-	-	-
22	0	0,0	0,0	-	-	-
23	1	5,0	151,7	0,0	-	0,0
24	0	0,0	0,0	-	-	-
25	2	10,0	445,8	50,0	49,5	0,0
26	0	0,0	0,0	-	-	-
27	1	5,0	113,1	100,0	44,0	0,0
28	1	5,0	107,6	0,0	-	0,0
29	0	0,0	0,0	-	-	-
30	1	5,0	202,5	0,0	-	0,0
TOTAL	20	100,0	3621,1	30,0	50,5	25,0

Source: Developed by the author Note: In all cases USD are PPP

Table A.12. Projects FONDEF by Area, Year 2005

	Year 2005					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	-	-	-
2	0	0,0	0,0	-	-	-
3	4	14,8	1010,1	25,0	54,5	75,0
4	2	7,4	408,4	0,0	42,0	100,0
5	0	0,0	0,0	-	-	-
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	4	14,8	800,0	0,0	46,0	25,0
9	0	0,0	0,0	-	-	-
10	0	0,0	0,0	-	-	-
11	0	0,0	0,0	-	-	-
12	0	0,0	0,0	-	-	-
13	1	3,7	321,1	100,0	41,0	0,0
14	4	14,8	799,0	25,0	58,0	100,0
15	1	3,7	18,0	0,0	45,0	25,0
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	3	11,1	396,3	0,0	59,5	33,3
19	0	0,0	0,0	-	-	-
20	0	0,0	0,0	-	-	-
21	0	0,0	0,0	-	-	-
22	0	0,0	0,0	-	-	-
23	1	3,7	144,9	0,0	-	0,0
24	0	0,0	0,0	-	-	-
25	3	11,1	704,3	33,3	45,0	0,0
26	0	0,0	0,0	-	-	-
27	2	7,4	392,7	100,0	44,0	50,0
28	1	3,7	60,0	0,0	-	0
29	0	0,0	0,0	-	-	-
30	1	3,7	48,3	0,0	-	0
TOTAL	27	112,5	5103,1	22,2	46,0	37,0

Source: Developed by the author Note: In all cases USD are PPP

Table A.13. Projects FONDEF by Area, Year 2006

	Year 2006					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	-	-	-
2	0	0,0	0,0	-	-	-
3	4	16,7	932,9	25,0	54,5	75,0
4	2	8,3	316,9	0,0	42,0	100,0
5	0	0,0	0,0	-	-	-
6	0	0,0	0,0	-	-	-
7	0	0,0	0,0	-	-	-
8	5	20,8	1076,0	0,0	47,0	20,0
9	0	0,0	0,0	-	-	-
10	0	0,0	0,0	-	-	-
11	0	0,0	0,0	-	-	-
12	0	0,0	0,0	-	-	-
13	1	4,2	296,5	100,0	41,0	0,0
14	4	16,7	688,8	25,0	58,0	25,0
15	0	0,0	0,0	-	-	-
16	0	0,0	0,0	-	-	-
17	0	0,0	0,0	-	-	-
18	2	8,3	293,3	0,0	62,0	0,0
19	0	0,0	0,0	-	-	-
20	0	0,0	0,0	-	-	-
21	0	0,0	0,0	-	-	-
22	0	0,0	0,0	-	-	-
23	1	4,2	66,9	0,0	-	0,0
24	1	4,2	121,1	100,0	51,0	100,0
25	2	8,3	642,1	0,0	44,5	0,0
26	0	0,0	0,0	-	-	-
27	2	8,3	312,8	100,0	44,0	50,0
28	0	0,0	0,0	-	-	-
29	0	0,0	0,0	-	-	-
30	0	0,0	0,0	-	-	-
TOTAL	24	100,0	4747,3	25,0	46,5	37,5

Source: Developed by the author

Table A.14. Projects FONIS by Area, Year 2004

	AÑO 2004					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	0,0	-	0,0
2	0	0,0	0,0	0,0	-	0,0
3	0	0,0	0,0	0,0	-	0,0
4	0	0,0	0,0	0,0	-	0,0
5	1	4,0	59,3	0,0	-	100,0
6	0	0,0	0,0	0,0	-	0,0
7	0	0,0	0,0	0,0	-	0,0
8	0	0,0	0,0	0,0	-	0,0
9	0	0,0	0,0	0,0	-	0,0
10	0	0,0	0,0	0,0	-	0,0
11	0	0,0	0,0	0,0	-	0,0
12	0	0,0	0,0	0,0	-	0,0
13	1	4,0	39,8	0,0	-	100,0
14	5	20,0	217,8	80,0	-	60,0
15	2	8,0	75,3	0,0	-	100,0
16	0	0,0	0,0	0,0	-	0,0
17	1	4,0	29,1	0,0	-	0,0
18	0	0,0	0,0	0,0	-	0,0
19	0	0,0	0,0	0,0	-	0,0
20	0	0,0	0,0	0,0	-	0,0
21	0	0,0	0,0	0,0	-	0,0
22	1	4,0	58,1	100,0	-	100,0
23	0	0,0	0,0	0,0	-	0,0
24	3	12,0	117,5	100,0	-	33,3
25	1	4,0	58,5	0,0	-	100,0
26	0	0,0	0,0	0,0	-	0,0
27	6	24,0	252,2	16,7	-	50,0
28	0	0,0	0,0	0,0	-	0,0
29	0	0,0	0,0	0,0	-	0,0
30	4	16,0	160,0	50,0	-	75,0
TOTAL	25	100,0	1067,8	44,0	-	64,0

Source: Developed by the author Note: In all cases USD are PPP

Table A.15. Projects FONIS by Area, Year 2005

	AÑO 2005					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	0,0	-	0,0
2	0	0,0	0,0	0,0	-	0,0
3	0	0,0	0,0	0,0	-	0,0
4	0	0,0	0,0	0,0	-	0,0
5	0	0,0	0,0	0,0	-	0,0
6	0	0,0	0,0	0,0	-	0,0
7	0	0,0	0,0	0,0	-	0,0
8	0	0,0	0,0	0,0	-	0,0
9	0	0,0	0,0	0,0	-	0,0
10	0	0,0	0,0	0,0	-	0,0
11	0	0,0	0,0	0,0	-	0,0
12	0	0,0	0,0	0,0	-	0,0
13	3	7,9	98,8	0,0	-	33,3
14	4	10,5	181,8	50,0	-	75,0
15	1	2,6	22,0	0,0	-	100,0
16	0	0,0	0,0	0,0	-	0,0
17	1	2,6	27,8	0,0	-	0,0
18	0	0,0	0,0	0,0	-	0,0
19	0	0,0	0,0	0,0	-	0,0
20	2	5,3	36,2	100,0	-	0,0
21	0	0,0	0,0	0,0	-	0,0
22	3	7,9	132,6	100,0	-	66,7
23	1	2,6	49,5	0,0	-	0,0
24	4	10,5	159,0	50,0	-	50,0
25	4	10,5	217,2	75,0	-	50,0
26	0	0,0	0,0	0,0	-	0,0
27	12	31,6	434,9	75,0	-	83,3
28	0	0,0	0,0	0,0	-	0,0
29	0	0,0	0,0	0,0	-	0,0
30	3	7,9	84,1	66,7	-	100,0
TOTAL	38	126,7	1443,9	60,5	-	63,2

Source: Developed by the author Note: In all cases USD are PPP

Table A.16. Projects FONIS by Area, Year 2006

	Year 2006					
Area	No. projects	% over total	USD (thousands)	% women	Age average	% in Santiago
1	0	0,0	0,0	0,0	-	0,0
2	0	0,0	0,0	0,0	-	0,0
3	0	0,0	0,0	0,0	-	0,0
4	2	6,7	99,8	50,0	-	100,0
5	0	0,0	0,0	0,0	-	0,0
6	0	0,0	0,0	0,0	-	0,0
7	0	0,0	0,0	0,0	-	0,0
8	0	0,0	0,0	0,0	-	0,0
9	0	0,0	0,0	0,0	-	0,0
10	0	0,0	0,0	0,0	-	0,0
11	0	0,0	0,0	0,0	-	0,0
12	0	0,0	0,0	0,0	-	0,0
13	2	6,7	76,8	50,0	-	0,0
14	3	10,0	91,2	33,3	-	100,0
15	0	0,0	0,0	0,0	-	0,0
16	1	3,3	42,1	0,0	-	0,0
17	0	0,0	0,0	0,0	-	0,0
18	1	3,3	49,0	0,0	-	0,0
19	0	0,0	0,0	0,0	-	0,0
20	1	3,3	36,6	100,0	-	0,0
21	0	0,0	0,0	0,0	-	0,0
22	1	3,3	55,1	0,0	-	0,0
23	0	0,0	0,0	0,0	-	0,0
24	3	10,0	86,1	66,7	-	0,0
25	0	0,0	0,0	0,0	-	0,0
26	0	0,0	0,0	0,0	-	0,0
27	13	43,3	416,1	38,5	-	76,9
28	0	0,0	0,0	0,0	-	0,0
29	0	0,0	0,0	0,0	-	0,0
30	3	10,0	99,5	33,3	-	100,0
TOTAL	30	100,0	1052,3	40,0	-	60,0

Source: Developed by the author Note: In all cases USD are PPP

Health Research Funding in Paraguay

Sergio Duarte Masi [35]

1. Introduction: The economic and sanitary context

In 2007 Paraguay had a population of 6 millions inhabitants, with only 58% of them living in urban areas. The Gross National Income (GNI) of the country in that year was of $26,8 billions, which represents USD PPP 4,380 per capita (World Bank, 2009).

Paraguay has a Human Development Index (HDI) of 0.752 for the year 2006, locating the country in the position number 98 among all United Nations member states. During the period 2000-2006, the country had 9% of population living under the poverty line (living with less than u$s 1,25 per day). In 2006, the adult literacy rate was 93,6% while 77% of population had access to improved drinking water sources in the country (United Nations Development Programme, 2008).

Table 1. Paraguay: Selected Indicators

1	Population (millions) (2007)	6
2	Urban Population (% of total pop.) (2005)	58,5
3	Human Development Index (HDI) / Country Position (2006)	0,752 (98)
4	Population living under the poverty line (% living on < 1,25 u$s per day) (2000-2006)	9,3
5	Adult literacy rate (% ages 15 and above) (2006)	93,6
6	Access to improved drinking water sources (%) (2006)	77
7	Gross National Income (GNI) PPP $ billions (2007)	26,8
8	Gross National Income (GNI) PPP $ per capita (2007)	4,380
9	Life Expectancy at Birth (years) (2007)	74
10	Infant Mortality Rate (IMR) (probability of dying between birth and age 1 per 1000 live births) (2007)	24

Sources/Notes:

World Bank, World Development Report 2009 (1, 2, 7, 8)

United Nations, United Nations Development Indices 2008. (3, 4, 5, 6)

World Health Organization, World Health Statistics 2009 (9, 10)

According to the World Health Organization, in 2007 life expectancy at birth in Paraguay was 74 years, and infant mortality rate shows that there were 24 deaths per 1000 live births in the country (World Health Organization, 2009).

The leading causes of death in Paraguay in 2003 were diseases of the circulatory system (28,2%), diseases of the perinatal period (14,8%), communicable diseases (12,9%), external causes (10,9%), tumors (7,4%). (Pan-American Health Organization, 2007b).

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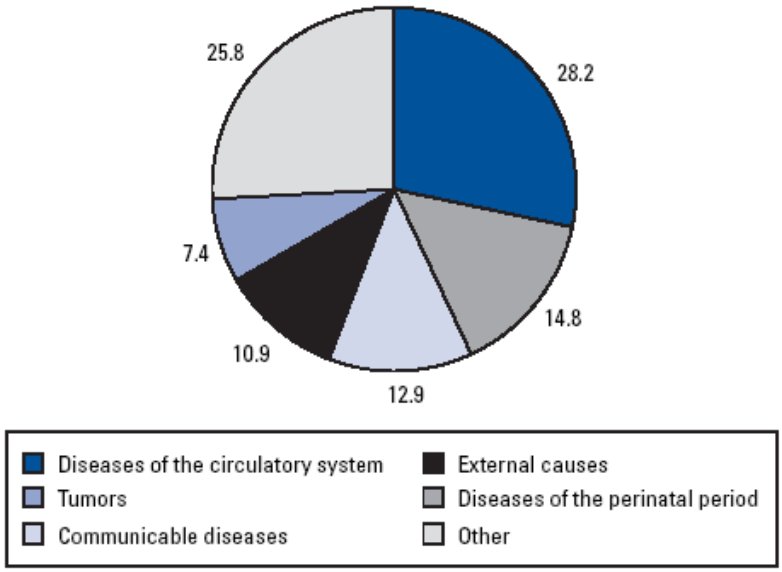
Figure 1: Proportional distribution of reported deaths, with defined causes, Paraguay, 2003.



Source: Pan-American Health Organization (2007b).

2. Historical background of Paraguay's National Science and Technology System

"In the history of Paraguay, consolidating the development of Science and Technology (S&T) had little bearing on the formulation of public policies. Reasons abound, yet the results were always the same: a perceptible lag in the culture and tradition of scientific research, as well as insufficient integration between S&T and the production of goods and services.

From early 17th to early 19th century in Paraguay's colonial period, because of the lack of material wealth, Spanish conquistadors transformed the country into a passageway towards other centers of greater interest to Spain (modern-day Bolivia and Peru), as well as a conglomerate of small companies dealing in yerba mate and livestock. The Spanish Crown was never concerned with creating universities in Paraguay, despite constant demands from Province of Paraguay authorities and settlers. However, one particular case of successful social, economic and cultural development came about thanks to the mutual exchange and transfer of knowledge between the European and the autochthonous Guarani civilizations, applied to systems of production and creating works of art and architecture. This experience was carried out by Compañía de Jesús (Company of Jesus) in the Provincia Jesuítica del Paraguay (Jesuit Province of Paraguay) in the 17th and 18th centuries, and brought about amazing results in economy (producing an exportable surplus of yerba mate), urbanism (the urban organization of the early Missions was exemplary), the arts (Spanish-Guarani Baroque made a contribution to global art) and science (one of the Rio de la Plata's first astronomical observatories was located in San Cosme and Damián, for instance)."[36]

By mid-20th century, General Stroessner rose to power in Paraguay and governed for 35 years (until 1989). Throughout this long period, not one single policy of the Stroessner

[36] Oxilia, Victorio. Propuesta para una Política Nacional de Ciencia y Tecnología, Asunción: CONACYT, October 2001, pages 1-2.

administration considered developing the national Science and Technology sector a high priority and, consequently the sector dropped behind even more. Thus despite collaboration from international organizations[37] to create institutions for administration, planning, research and development, Paraguay was unable to create an effective structure of financial support for research or a coordinating unit during this period. Nor was it possible to create public policy for the country's Science and Technology sector, although there was some movements toward this goal.

After World War II -while bolstered by international cooperation Latin America's most highly developed countries were focusing on introducing the variables of science and technology into their plans for industry-based economic development- Paraguay was rebuilding its economy by consolidating a family-based agricultural production system. The scant research taking place centered almost completely on public health and medical issues. However, in no case were research activities systemized by applying specific, explicit public policies.[38]

In the 60s and early 70s, trade with Brazil opened up, accompanied by the construction of the ITAIPÚ Binational hydropower plant and the expansion of agricultural borders in Paraguay's east and south regions (initially in Itapúa and Alto Paraná Departments), thanks to national and foreign business investing in the mechanized agriculture of hybrid corn, soy and wheat.

Although interest in science and technology has grown in Paraguay since then, it remains – as one may presume- clearly focused on researching and developing technology for agriculture and agro-industrial production. The main characteristic of this most recent stage was the definition, albeit not very systematically, of a public policy of Science and Technology focused on economic growth. This period witnessed the creation of three key institutions: Secretariat for Technical Planning (1962), the National Institute of Technology and Standardization – INTN (1963) and the National Department of Technology (1976).

As for the Science and Technology sector (S&T), at this point in time, three aspects which were considered high priority were promoted:

a) improving the infrastructure of Science and Technology education

b) planning and coordinating the sector

c) researching and developing areas connected to key economic sectors (agriculture and stockbreeding).

In February 1989, Paraguay underwent great political change with the ousting of General Stroessner. For this reason, measures taken by the transition government of 1989-1993 essentially aimed at consolidating the country's newly-implanted democratic process and the institutional strengthening of public administration. Little concrete action focused on the S&T sector.

One such measure took place in early 1989, when the Chamber of Representatives formed a Committee for Science and Technology, which became a strong supporter of the subsequent writing of legislation. In 1990, the committee sponsored and organized the Technology Forum for the Development of Paraguay, and as a result of the debate among attendees -

[37] From mid '50s to the late '70s, the United States3 supported the development of Latin American countries, including Paraguay, as a part of its policy of using Latin America as a buffer against Communism. Within this context in 1961, President John F. Kennedy promoted the "Alliance for Progress" plan. Almost simultaneously, Paraguay strengthened its relations with other Latin American countries and in 1962 joined the Latin American Free Trade Association created by the 1960 Treaty of Montevideo. (cf. Caballero Aquino, R., La Tercera República Paraguaya. 1936 – 19.., Asunción: El Lector, 1988, page 5).

[38] CONACYT. Propuesta para una Política Nacional de Ciencia y Tecnología, op.cit., p.2.

entrepreneurs, researchers, government and legislators- priorities for the development of S&T were identified in terms of organization, education, taxation and funding[39].

It is important to note that all of Paraguay's S&T legalization was enacted while great changes were taking place on the international scene. Science and Technology began to play a key role in countries' social and economic development. In effect, the most outstanding worldwide change in S&T in recent decades was an explicit recognition of the sector's commitment to seeking solutions for social issues as well as economic and cultural development.

Since 1997, with clearly defined functions - framing and proposing policies and strategies for scientific and technological development, coordinating S&T activities, training the country's human resources, among others- CONACYT has given the sector a renewed boost, mainly by carrying out a diagnosis of the Paraguayan S&T sector, organizing Symposiums and Congresses, training staff, participating in regional and international activities, proposing scientific policy, and sponsoring projects which promote interaction among the system's actors.

The creation of CONACYT coincided with a exceptional downturn in Paraguay's economy. This seriously affected the country amid a political and financial crisis originated by the dynamics of trade with neighboring countries and international finance, as well as short-term cutbacks geared towards halting inflation and improving the trade balance. As a result, policies tending to control spending were put forward, which did not get in the way of accomplishing the more modest objectives -whether short- or long-term- of providing the S&T sector with financial aid.

3. The National Innovation System in Health in Paraguay

As is well known, the concept of "National System of Technological Innovation" presents operational problems, given that it is not a clearly defined nor empirically contrasted theory. Rather, it is a framework within which to raise ideas and arguments regarding issues all nations must face.[40]

Nelson (1993) states there is no ideal Innovation System against which other systems could be compared for their analysis. Research has shown that very differently configured systems can lead to equally successful outcomes. As a result there is no sole recommendation about how much basic science should be done, which sectors should be specialized, or how innovation should be organized, etc.[41]

It was Lundvall (1992) who first used the term *National Innovation System* or NSI. In a book in which he analyzed this issue, he explained that the idea had been proposed as early as 1841, when Friederich List introduced the concept of a *National System of Political Economy*. Today this may well be interpreted as a NSI.

The Regional Meeting of Consultation of Latin America and the Caribbean –which took place prior to the 1999 World Conference on Science- admitted in its Santo Domingo Declaration that knowledge alone does not bring about change in economies or society, but can only do

[39] National Department of Technology/Paraguayan Industrial Union/S&T Commission of the Chamber of Deputies/Ministry of Industry and Commerce/National University of Asunción/Organization of American States (OAS), "Foro de Tecnología para el Desarrollo del Paraguay" (Forum of Technology for the Development of Paraguay), Asunción, August/September 1990 (Documents of the Forum).

[40] Edquist, C. (1997), "Systems of Innovation Approaches-Their Emergence and Characteristics", in C. Edquist (ed.), Systems of Innovation: Technologies, Institutions and Organizations, Pinter, London.

[41] Nelson, R. (ed.) (1993), "National innovation systems. A Comparative Analysis", Oxford University Press, New York.

so within a framework of social/national systems for science, technology and innovation, making its inclusion in the production of goods and services possible. At the meeting it was stated that: “Social/national systems of science, technology and innovation form networks of institutions, resources, interactions and relationships, mechanisms and tools for policy, in addition to scientific and technological activities that promote, articulate and materialize the innovation processes and technological diffusion within society by generating, importing, adapting and diffusing technology."

Continuing along this conceptual line of what may be labeled a *National Innovation System*, in Paraguay there are several environments that comprise an NSI:

1) The *government/legislative environment,* with the presence of the National Council of Science and Technology. Created by Law 1028/97, the Council is an autonomous public organization of varied composition which responds to the President of the Republic, and helps manage and coordinate the system

2) The *academic environment*, made up of a total of 36 educational centers, both public and private universities

3) The *productive environment*, made up of both public and private businesses dealing in goods and services, most belonging to trade associations or guilds

4) *Interface structures*, such as management centers and consulting, as well as university outreach

5) The *technological environment,* made up of public and private structures established for technique development

6) The *financial environment*, national and international

Yet these environments in Paraguay are not sufficiently developed, sound nor interconnected in a balanced enough way to allow them to operate as a system. Thus the national experience has confirmed the need for reviewing and updating the concepts and priorities in the use of its scientific-technological potential and how these environments interrelate, with the intent of developing a policy to develop and balance components of Paraguay’s National Innovation System.

An exploratory study of CONACYT -carried out with cooperation from Colombia through the participation of Colciencias[42] and SENA[43] experts- produced the following hypotheses[44]:

- The principal agents in the National Innovation System have been established, but their interrelations have not.
- There is a lack of overall correlation among agents.
- The financial subsystem and facilitator -the government- is clearly deficient in promoting and financing innovation projects for small and medium businesses.
- Technological development centers, research centers, productive chains and clusters need to gain experience and knowledge in developing innovative projects along with the companies, service providers and laboratories.
- Universities should implement clear and effective policies to encourage educators to take part in business-related innovation projects. The government should support this kind of initiative through co-funding and oversight, as well as making successful cases known and socializing positive results.

[42] Colciencias is the Francisco José de Caldas Institute for the Development of Science and Technology of Colombia.

[43] SENA is the acronym in Spanish for Colombia’s National Learning Service.

[44] In 2003 the participants of the mentioned study were: Doctor Julio Mario Rodríguez Devis (Director of Innovation Area) as a representative of Colciencias and Doctor Claudia Marcela Farfán Perdomo (Consultant of the Program of Incubators of Technological Basis) on behalf of SENA.

Since its founding in 1999, the CONACYT has shown vision in organizing forums, workshops and consult sessions nationally: the *Primera Jornada de Consulta sobre Demandas de Ciencia y Tecnología* (First Consultation Workshop on Demands in Science and Technology) in May 1999; the *Seminario sobre Reglamentaciones Técnicas en las Américas* (Seminar on Technical Regulation in the Americas) in October 1999; the Simp*osio sobre Políticas Nacionales en Ciencia, Tecnología e Innovación* (Symposium on National Science, Technology and Innovation Policy) in October 2000; the *Taller sobre Gestión Tecnológica e Innovación* (Workshop on Management of Technology and Innovation) in April 2001; the *Seminario sobre Propiedad Intelectual* (Seminar on Intellectual Property) in June 2001, and the *Primer Taller Nacional sobre Indicadores de Ciencia, Tecnología e Innovación* (First National Workshop on Science, Technology and Innovation Indicators) in September 2001.

4. Paraguay's legal framework for Science and Technology

Among the legal regulations that provided a framework for the initial organization of activity within Science, Technology and Research is Decree Law 20.351 of 1976 which created the National Department of Technology, governed by the National Technology and Normalization Institute or INTN. Because this organization operates at the fourth level of government, however, it has been unable to influence political decisions in these areas. Between 1976 and 1997, the department's activities were geared towards raising awareness of the need of a system for Science, Technology and Research, which was achieved in 1997 when the National Congress of Paraguay passed Law 1.028 and created the National System of Science and Technology. This law also established the founding of CONACYT to provide the government with counsel on Science and Technology policy, and the creation of FONACYT, to provide funding for related activities.

In addition, Law 1.028/97 describes high priority components which must be included in national Science and Technology programs: the generation and innovation of Science and Technology; adapting scientific methodologies and techniques; the transfer, utilization and assimilation of scientific and technological knowledge; high level training of human resources in Science and Technology; enhancing the management of Science and Technology in the national sphere; and diffusion and popularization of the scientific and technological information.

In 2003, Law 1.028/97 was replaced by Law Nº 2.279 which reviewed and expanded its scope, explicitly creating Paraguay's National Innovation System. On April 20, 1998 the Executive Power signed Decree 20.660, creating the National Accreditation Department (ONA) under CONACYT.

Among the legal instruments linked to Science and Technology we may mention the General Law of Education 1.264, passed in 1998. This law grants education a prominent role in consolidating democracy, reducing poverty and marginality rates and seeking new opportunities for welfare. Moreover, it establishes the principles and general purposes which must inspire and guide both public and private education, regulating the national education system's organization and structure, determining rules for participation and the duties of community members and education centers, ways to fund the public education sector and other responsibilities of the system.

Other legal instruments include: Brand Law 751/79, Patent Law 773/25, Law of Intellectual Property 94/51 and Metrology Law 937/82.

4.1. Institutions within Paraguay's Innovation System

Consejo Nacional de Ciencia y Tecnología – CONACYT (National Council of Science and Technology), an autonomous public organization of mixed composition, which operates under the President of the Republic. It manages and coordinates the National System for Science, Technology, Innovation and Quality, in addition to supporting the country's scientific and technological development. The Council is guided by specific policies and programs promoted by the public sector and duly coordinated with the private sector.

The Council of the CONACYT is conformed by representatives from the following institutions:

- Secretaría Técnica de Planificación Económica y Social de la Presidencia de la República – STP (Technical Department of Economic and Social Planning of the Republic's Presidency)
- Ministerio de Industria y Comercio – MIC (Ministry of Industry and Commerce), through the Instituto Nacional de Tecnología y Normalización - INTN (National Institute of Technology and Normalization)
- Ministerio de Agricultura y Ganadería – MAG (Ministry of Agriculture and Stockbreeding)
- Ministerio de Salud Pública y Bienestar Social – MSPyBS (Ministry of Public Health and Social Welfare)
- Ministerio de Educación y Cultura – MEC (Ministry of Education and Culture)
- Public universities
- Private universities
- Federación de la Producción, de la Industria y el Comercio – FEPRINCO (Federation of Production, Industry and Commerce)
- Unión Industrial Paraguaya – UIP (Paraguayan Industrial Union)
- Asociación Rural del Paraguay – ARP (Rural Association of Paraguay)
- Asociación de las Pequeñas y Medianas Empresas – APYME (Association of Small and Medium Businesses)
- Asociación Paraguaya para la Calidad – APC (Paraguayan Association for Quality)
- Sociedad Científica del Paraguay – (Scientific Society of Paraguay)
- Labor union centers

CONACYT operates by means of an executive department subordinated to the Council and two boards of directors: the Technological Management and Innovation Board, and the Scientific Development and Human Resource Training Board.

For its operation, the CONACYT receives funds from the Presidency of the Republic, and for the development of specific projects (either for the development of Science and Technology, and also of Conformity Evaluation Systems) it receives funds from international organizations/representations, such as the InterAmerican Development Bank, the European Union, the Mercosur, among others.

Since the year 2.006 is active a Program in Support of the Scientific Research and of the Technology Innovation. This Program is multidisciplinary and in one its focus, the research in the areas of health is being contemplated.

Organismo Nacional de Acreditación – ONA (National Accreditation Department) is a CONACYT institution in charge of ensuring transparency and impartiality when applying conformity evaluation systems. With its operative autonomy, ONA is in charge of accrediting certification and inspection associations, testing and calibration laboratories, auditor certification boards and training centers.

Fondo Nacional de Ciencia y Tecnología – FONACYT (National Science and Technology Fund) is a CONACYT department in charge of funding scientific research and technological development programs and projects for the adaptation of new technologies and its diffusion. Such fund is still under strengthening.

The University Domain

The domain of the university was a practically static segment until the mid 90s, when there was a true "boom" in the creation of universities. Most offered programs in the Social Sciences, especially business-related.

In 2008, the number of universities in Paraguay surpassed 37 institutions. Yet the general opinion is that Paraguay's higher education is undergoing a deep crisis, a debate taking place mostly beyond the university's domain, promoted by intellectuals, professionals, university unions and student associations.

Results of CONACYT research activities between 2001 and 2006 show that the Paraguayan University transfers knowledge rather than generating it, with the exception of a few education centers such as *Universidad Nacional de Asunción* – UNA (National University of Asunción)[45] and *Universidad Católica Nuestra Señora de la Asunción* – UCA (Our Lady of Asunción Catholic University).[46] These institutions have generated the most knowledge in the country and have achieved remarkable interaction with the business sector[47].

Government sector

In Paraguay, according to surveys conducted by CONACYT since 2001, the government is responsible for most of the specific expenditure in R&D -74.20%- although Paraguay's expenditure is one of the lowest in the region (0.08% of GDP, according to the latest 2006 survey.)

Government institutions that make up Paraguay's innovation system are:

[45] The National University of Asunción is made up of the following schools: Physical Sciences and Mathematics, Medical Sciences, Chemical Sciences, Agricultural Sciences, Veterinarian Sciences, Exact and Natural Sciences, Legal and Social Sciences, Philosophy, Polytechnics, the Institute of Research in Health Sciences, National Center of Computer Science, Research Development Department and Multidisciplinary Technological Research Center.

[46] Within Our Lady of Asunción Catholic University are: the School of Science and Technology, the School of Philosophy and Human Sciences, the School of Legal and Diplomatic Sciences, the Center of Appropriate Technology, the Study and Research Center of Rural Rights and Agricultural Reform, and the Superior Institute of Humanistic and Philosophical Studies.

[47] Other universities in Paraguay worth mentioning are: National University of Itapúa, National University of the East, National University of Pilar, Autonomous University of Asuncion (UAA), Autonomous University of Paraguay (UAP), University of the North (UNINORTE), University of Southern Cone of Americas (UCSA), Evangelical University of Paraguay (UEP), University of the Pacific (UP), Polytechnic and Artistic University of Paraguay (UPAP), Technological and Intercontinental University (UTIC), Technological University of Commercialization and Development (UTCD), Iber-American University (UNIBE), Private University of the East (UPE), Metropolitan University, Comunera University (UCOM), Autonomous University of Luque (UAL), University of Integration of the Americas (UNIDA), Columbia University of Paraguay (UCP), American University (UA), University of Sustainable Development (UDS).

- **Secretaría Técnica de Planificación (Technical Planning Department)** Coordinates scientific and technological activities and international technical cooperation.
- **Ministry of Agriculture and Stockbreeding** Operates in R&D and instructs human resources, mainly through its centers: Instituto Agronómico Nacional – IAN (National Agronomy Institute); Dirección de Investigaciones Agrícolas – DIA (Agricultural Research Board); and the Dirección de Protección Animal – DIPA (Animal Protection Board).
- **Ministry of Public Health and Social Welfare (MSPyBS)** Operates in R&D and instructs human resources in the areas of technology and medical sciences through the following institutions: Central Public Health Laboratory; National Health Institute; National Food and Nutrition Institute; and the Institute of Tropical Medicine.
- **Ministry of Industry and Commerce** Operates in R&D and instructs human resources in the area of political sciences and public administration through Instituto Nacional de Tecnología y Normalización – INTN (National Institute of Technology and Normalization).
- **Ministry of Education and Culture** Operates in R&D and instructs human resources in the areas of superior education and the arts.
- **Ministry of Public Works and Communication** Operates in applied research.

Non-Government Organizations

Organizaciones Privadas sin fines de Lucro – OPSFL (Private Nonprofit Organizations) play an important role in the research activity of Paraguay. They concentrate 7% of human resources devoted to research and execute approximately 4.5% of R&D expenditure in terms of the national GDP.[48]

Technological sector and interface structures

The technological sector and interface structures are perhaps the least developed sectors in Paraguay, and focus mainly on services and quality control, mostly divided among the agricultural and livestock sector.[49]

[48] The following entities are non-government organizations: Alter Vida; Institute of Pathological Research; Ceppro; Base ECTA; Fudacode; Idap; Phycis Foundation; Academy for Scientific Education; Cectec; Cepades; CEDES/Habitat; Paraguayan Association for Quality; Center of Analysis and Diffusion of Paraguayan Economy; Paraguayan Nature Protection Society; Pre-ver Health Promotion; Urban and Rural Development Project (PREDESUR); Environmental Protection Association; Foundation for Comprehensive Human Development; Doctor Moisés Bertoni Ecological Society del Alto Paraná; Center for the Preservation of Environmental World Heritage; Committee for Health and Environmental Impact Studies; Agro-Ecologic Development for the Human Development Sub-Program (FNPDS); Paraguayan Foundation for Ecology and Development (FUDEP); Sevicona; Paraguay-Kansas Committee; Scientific Society of Paraguay; Andrés Barbero Museum; Teodoro Rojas Museum of Natural Sciences; Paraguayan Center of Sociological Studies; Consortium of Livestock Breeders for the Agriculture and Livestock Experimentation Consorcio de Ganaderos para Experimentación Agropecuario (CEA).

[49] The following structures (most are public, others belong to the university and a smaller percentage belongs to the private sector) can be mentioned: Multidisciplinary Research and Technology Center (CEMIT)– National University of Asunción; Center of Appropriate Technology (CTA) – Catholic University; Technological Livestock Center of Paraguay (CETAPAR)– JICA Cooperation; National Institute of Technology and Normalization (INTN) – Ministry of Industry and Commerce; Center for Stylistic Design and Fashion (CEDEM)– Ministry of Industry and Commerce; Technological Timber Center (CETIMA) – Ministry of Industry and Commerce; Itaipú Technological Park (PTI) Itaipú Bi-National Company; Center of Integral Support to Micro, Small and Medium Companies (CIAMP) – Ministry of Industry and Commerce; CEDIAL – Industrial Union of Paraguay.

5. Paraguay's Health System[50]

Article 68 of the National Constitution passed in 1992 deals with the right to health, and states that the Government will protect and promote health as a fundamental right of the person and as being of interest to the community. The basic values assumed by the health sector are universal coverage, integral assistance, equal benefits, solidarity and social responsibility.

Paraguay's National Health System (SNS) is regulated by Law 1032/96[51] which in Article 4 defines its duties as offering health services through the public, private or mixed sub-sectors, health insurance companies and universities.

Decree 21,376/98 states that the role of the Ministry of Public Health and Social Welfare – MSPyBS- should be to guide the health sector's programs and activities in order to regulate and oversee any public and private action which may have an impact on individual and collective health.

Despite that the creation of the National Council of Science and Technology, by the Law 1.028 "General of Science and Technology" dates from the year 1996, its actual conformation and effective activation occurs after the year 2000, and as it can be seen, is later than the actions started in the health sector, and as for today there is still a great dispersion of tasks without being able to reach a consensus in the health agenda that links the research, the science and technology, and the health system.

Paraguay's health system presents a high segmentation among providers, with little coordination among different sub-sectors. The actions of the MSPyBS and the Social Security Institute overlap; so do those of IPS and the private sector. The structure of the Ministry's service network in 2007 included 984 institutions; its primary network made up of 117 health care centers and 730 health care posts

The Social Security Institute encompasses 93 services organized into three levels of health care and eight levels of complexity. The Primary Level is organized around 48 health care posts, 5 peripheral clinics and 25 sanitary units. IPS grants coverage to affiliates and their offspring under the age of 18, as well as elder dependants.

The health system in Paraguay is in a full pilot phase tending toward decentralization. This experiment began in 1996 with Law 1032 which stated the guidelines for decentralization, regulated by Decree 19,966/98. A trial experience was carried out in 1998: 23 towns subscribed to decentralization agreements; however only 10 of them have effectively implemented this management approach. The same occurred in 2000 and 2005 with the decentralization of 15 and 16 towns, respectively. Decentralization agreements between MSPyBS and institutions of the Ministry's services network served as the legal framework for these experiences.

From 2003 to 2004, coverage of the public sub-sector rose from 38.2% to 44.9% of the population requiring care due to illnesses or accidents. Social security fell slightly, from 12.2% to 10.6%. Patient care in the private sector also decreased from 49.6% to 44.5%.

5.1. Analysis of the actors in Paraguay's health system

The government institution regarding the National Health System is the **Ministry of Public**

[50] Extracted from document: "Perfil de los sistemas de salud Paraguay: Monitoreo y análisis de los procesos de cambio y reforma". Organización Panamericana de la Salud, 2008.

[51] Law 1,032/96 established the creation of the National Health System.

Health and Social Welfare, and through such the following actors/institutions[52]* are linked and/or coordinated:

5.1.1. Public Sector

National Health Council. Regulated by Chapter IV of Law 1032, it is responsible for the inter-institutional participation, coordination and consensus of the private and public health sector (Article 19). It is made up by a representative from each of the following institutions: Ministry of Public Health and Social Welfare, Treasury Department; Ministry of Education and Culture; Chamber of Deputies Public Health Committee; Senate Health Committee; Technical Planning Department; National University of Asuncion Schools: School of Medical Sciences, School of Dentistry, Nursing School; School of Chemical Sciences; Social Security Institute; Association of Private Hospitals and Clinics; Council of Governors; Paraguayan Organization of Inter-town Cooperation; Association of Department Boards; Paraguayan Medical Association; Dental Association of Paraguay; Union of Chemists of Paraguay; National Nurses Association; labor unions; employer federations; health worker unions; CORPOSANA; SENASA; Sanidad Militar (Military Health Department); Sanidad Policial (Police Health Department); Non-Government Organizations and National Agricultural Workers' Union (Article 21).

National Medical Board This technical department is in charge of standardizing and managing the Services System, jointly with the **Health Superintendence** which is responsible for the accreditation and quality control of services offered by the system (Article 33, Law 1032).

National Health Fund Established by Law 1032 (Article 40) and the **Executive Financial Board**, it is in charge of developing the System's funding policy.

Regional Council. An assembly of representatives from various institutions of the health sector. The Council gets together for an ordinary meeting every two months and an extraordinary meeting whenever necessary. Its steering committee comprises a president (filled by the governor's Health Department Secretary), a vice-president and three members who are named at the first general meeting. Any institution interested in taking part of the Regional Council may join, for which they must submit to the steering committee a written request proving their affiliation to the health sector. The committee has fifteen days to reply after which if no response is received, the institution is incorporated automatically (Article 23, Law 1032).

Local Council. An assembly of representatives from various institutions of the health sector. The Council gets together for an ordinary meeting every two months and an extraordinary meeting whenever necessary. Its steering committee comprises a president (filled by the head of the Municipal Health and Hygiene Board) a vice-president and three members elected at the first general meeting, and must meet at least every two weeks. Institutions interested in being seated on the Council must submit to the steering committee a written request proving their affiliation to the health sector. The committee has fifteen days to reply after which if no response is received, the institution is incorporated automatically (Article 24, Law 1032).

Departmental and Municipal Health divisions Operating under sub-national governments, they are financed by their own resources.

[52] All the actors/institutions below mentioned are effectively created by the laws that govern the areas of health, but many of such are still in an incipient state of development. To establish an inter-relationship map between those actors/institutions would require a more exhaustive study with a more qualitative perspective.

5.1.2. Private sector

Cámara de Instituciones Médicas Asistenciales del Paraguay – CIMAP (Paraguayan Chamber of Medical Care Institutions) Created in 1987, it assembles all businesses which directly and indirectly provide services within the Pre-Paid Health Service System. There are currently 16 such businesses.

5.1.3. Civil society organized around health

The civil society organized around health includes **guilds, labor associations, labor unions,** etc. The structure and organization of the labor union movement in the country is composed of five unions; the largest, most representative of them being CUT, CNT and CESITEP. The *Círculo Paraguayo de Médicos* – CPM (Paraguayan Medical Alliance) is the most active example of organized civil society within the health system, along with the *Asociación Paraguaya de Enfermeras* – APE (Paraguayan Nurses Association). The participation of these two entities chiefly focus on actions connected with their members' union demands.

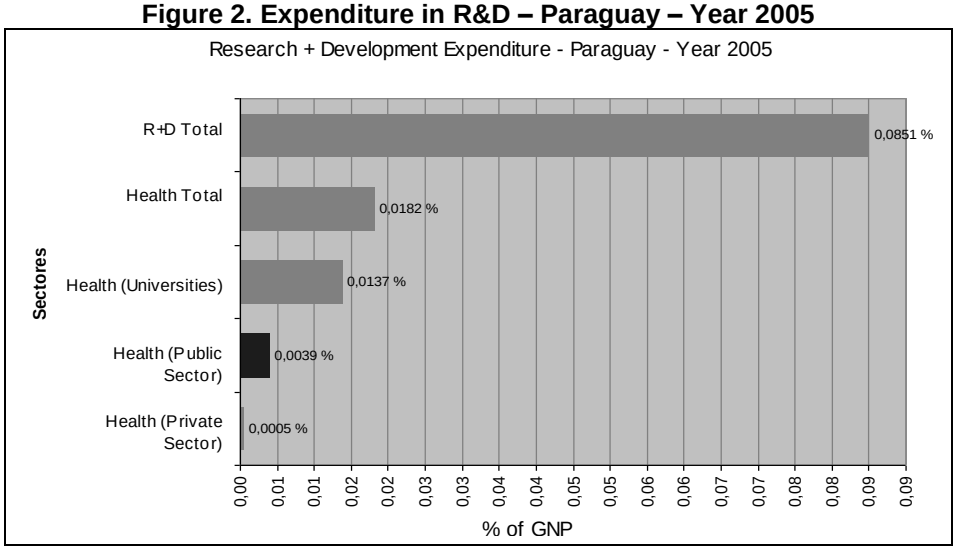
6. Health Sector Funding in Paraguay

From 1997 to 2004, the health sector in Paraguay represented an average 7.2% of the Gross Domestic Product (GDP). This percentage fluctuated throughout the period, from 6.3% in 1997, reaching a maximum of 8.4 in 2001, and dropping to 6.5% in 2004. Paraguay's health expenditure increased from 1.3 to 2.7 billion guaranies at current prices in the same period.

From 2000 to 2004, per capita public expenditure on health averaged 152,569 guaranies, while private expenditure was 277,108 guaranies at current values. Public expenditure values per capita equaled $31 U.S. dollars, private expenditure equaled $55 U.S. dollars, on average for this period.

According to indicators collected by CONACYT since 2001, health is the sector whose research activities generated the most international publications, represented by 23% of the total population of researchers (168 people in 2006), 46 of which belong to the public sector.

Figure 2. Expenditure in R&D – Paraguay – Year 2005



Source: Developed by the author. Indicators of S&T. CONACYT (2006)

From 2000 to 2004, public expenditure in health averaged 35.6% of the total expenditure in this area, while private expenditure reached 64.4%. Per capita public health spending averaged 152,569 guaranies and private expenditure 277,108 guaranies, at current values

for the period mentioned. These per capita values equaled US $31 in the case of public expenditure and US $55 in case of private.

During that period, 70.8% of public health was funded by government resources, 16.8% by institutional resources and 12.4% by foreign aid. For the period analyzed, financing with government resources increased by 19.2% and institutional rose by 8.1%. In contrast, foreign aid fell by 19.4%.

6.1. Public financing institutions

Consejo Nacional de Ciencia y Tecnología – CONACYT (National Science and Technology Council), created by Law 1028 in 1997, is the main organization dedicated to the promotion of Science and Technology in Paraguay. This law also created the Fondo Nacional de Ciencia y Tecnología – FONACYT (National Fund for Science and Technology). However, it began its operations later in 2008, launching PR 126, BID-CONACYT -a support program for Science, Technology and Innovation, in which health is one of the highest priority areas.

Universidad Nacional de Asunción – UNA (National University of Asuncion) is the oldest, most important state organization of higher education in the Republic of Paraguay. It has the largest student population (approximately 30,000 to 40,000 students) and academic staff (about 5000 teachers), and is the most internationally renowned. UNA is allotted the most government funds of any of Paraguay's four public universities. Additionally, it has produced the largest number of scientific publications domestically. In terms of research, UNA has its own fund to sponsor awardable research projects for its 12 schools and its Research Centers: Training and Service Center, National Center of Computer Science, National Energy Board and the Institute for Research in Health Sciences.

Instituto de Investigaciones en Ciencias de la Salud – IICS (Institute for Health Science Research) was established in 1980 in order to create, implement and promote scientific research in the area of health sciences, by contributing knowledge and solutions for the country's most outstanding issues, training human resources and developing specialized services for the improvement of the community's health.

At present, IICS employs approximately 111 researchers, 23% of which are dedicated to areas related to biotechnology such as biochemical research methods, biochemistry and molecular biochemistry, microbiological applications, cellular biology, genetics and biomedicine. In addition, researchers are dedicated to other knowledge areas with the following distribution: engineering science 3.5%, human science 3.5% and health sciences 70%. Thus, 35% of its research activity is focused on basic research, 60% on applied research and 5% corresponds to technological development.

In the bibliometric study CONACYT realized in 2005, IICS appears as one of the Paraguayan entities which generated the most publications internationally, particularly in the area of health care.

Ministerio de Salud Pública y Bienestar Social – MSPyBS (Ministry of Public Health and Social Welfare)

Official health services in Paraguay were first run by the Ministry of the Interior until 1936, when Coronel Rafael Franco's administration passed a Decree-Law 2000 on June 15, creating the Ministry of Health, and elevating it to the status of State Department. Its fundamental duties were to care for and defend the health of the Paraguayan people. The Organic Law of Public Health –as per Decree-Law 2001 also passed on June 15 and approved by Executive Power- established the organization and administration of the

Republic of Paraguay Sanitary Service in order to promote general health and provide sanitary assistance to the country's entire population.

Health research inexorably occurred within the sphere of the university. In 1996 the Health Ministry's Laboratorio Central de Salud Pública – LCSP (Central Public Health Laboratory) was founded with the mission of: providing laboratory assistance, being the nation's laboratory of record and the head of the National Laboratory System; regulating, evaluating and supervising clinical laboratories in the country's public and private sector; performing applied research in response to high priority and health policy issues focusing on the most frequent pathologies in Paraguay; carrying out activities of permanent education and helping train health workers, and supporting the epidemiological surveillance in Public Health and Social Welfare Ministry programs.

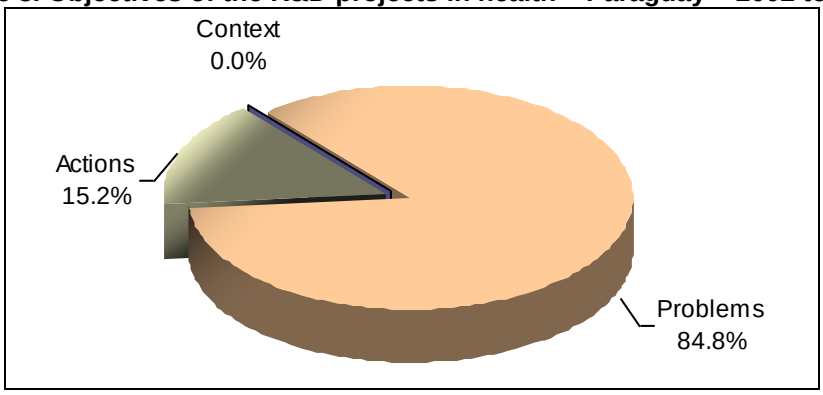
The LCSP currently employs 55 researchers who carry out activities in biochemical research methods, biochemistry and molecular biochemistry, microbiological applications, general health and diagnosis, as well as laboratory oversight, epidemiological research and production of reagents.

7. Research in the Paraguayan health sector

In order to analyze health projects, we considered 24 categories (see Methodology), which in turn may be grouped into three objectives: *the social, economic and cultural context*; *facing problems* (communicable illnesses, non-communicable illnesses and addictions; nutrition and the environment, violence and accidents), and *actions* (research on health policy, systems and services; research and technological development, and traditional medicine).

The study of the 178 projects developed between 2002 and 2006 which were awarded funds revealed that public research focused mostly on *facing problems* (84.8%), mainly in areas of transmissible illnesses: Dengue, Visceral Leishmaniosis, Chagas Disease, Hantavirus and Zoonosis. Paraguay has a national plan to prevent Chagas Disease by interrupting its vectorial transmission which in Paraguay, is exclusively due to *Triatoma infestans.* Much research focuses on this issue. Projects related to *actions* represent 15.2%, while we were unable to record any projects which focused on *context.* This distribution is seen in Figure 3.

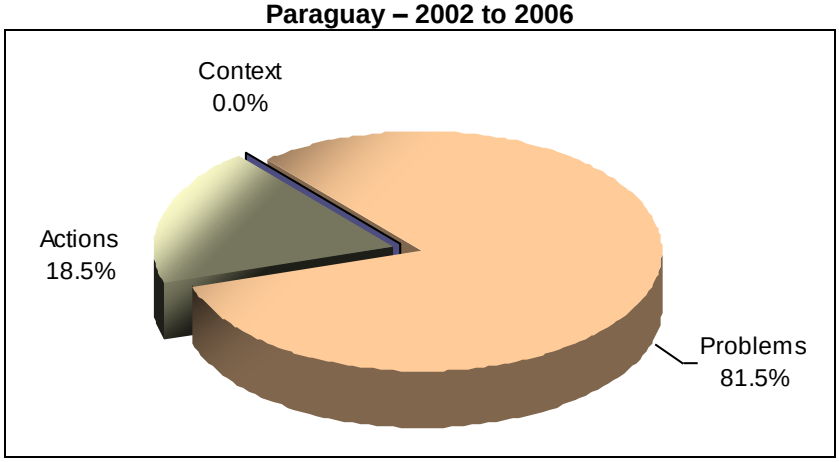
Figure 3. Objectives of the R&D projects in health – Paraguay – 2002 to 2006



Source: Developed by the author

If the aforementioned project dossier numbering 178 studies (see Table 2) were grouped differently, that is, by public institution that researches health issues (IICS at UNA, research units belonging to the Ministry of Public Health and Social Welfare) a similar trend is observed at IICS: there is an emphasis on researching and *problem solving* (81.5%) and to a lesser extent *actions* (18.5%). (See Figure 4.) The Ministry of Public Health and Social Welfare presents 100% dedication to *actions*.

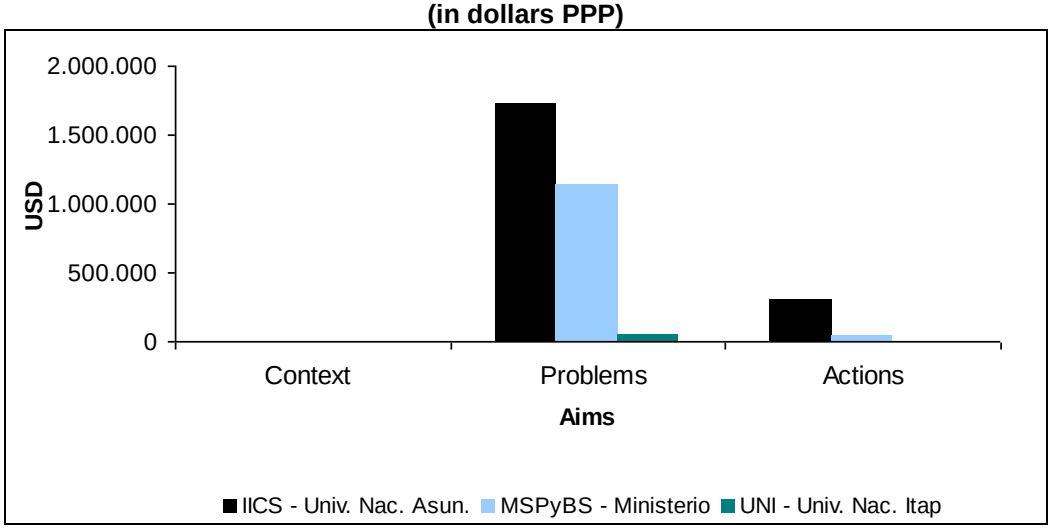
Figure 4. Objectives of R&D projects in Health – IICS – National University of Asuncion - Paraguay – 2002 to 2006



Source: Developed by the author

As would be expected (see Figure 5), awarded funding coincides with research objectives: out of a total health investment of US$ 2,289,564 PP for the period 2002-2006, 89.95% was awarded to *problems* and 10.05% to *actions*. If we were to group this cumulative amount by sectors, 54.68% was performed by IICS at UNA and 35.27% by the MSPyBS (not counting related activities in hospitals and health care centers). The remaining 10.05% corresponds to the National University of Itapúa, which had no health projects until 2006.

Figure 5. Distribution of amounts awarded to R&D in health (2002 to 2006). Paraguay (in dollars PPP)



Source: Developed by the author

Table 2 shows ungrouped objectives as inscribed in three macro-categories. From 2002 to 2006, within *Problems,* emphasis was put on communicable diseases, with a total of 80 studies distributed evenly among the following categories: biomedical (23 studies), clinical (30 studies) and public health (27 studies). The second priority of the *Problems* category was non-communicable diseases and addictions, with a total of 66 studies, in turn classifiable into 12 studies in biomedicine, 30 in clinical medicine and 24 in public health. For the same period, in the *Actions* macro-category, the area that stands out is technical research and development with 23 studies, 19 of which centered on biomedicine and 4 on clinical medicine. In the same way, it's important to point out that in *Actions* Paraguay didn't have any project on basic science.

Table 2. Project distribution by categories (2002-2006)

			Research Methodology			
			Biomedical	Clinic	Public Health	TOTAL
Objectives	Context	Socioeconomic - Cultural	-	-	-	-
	Problems	Communicable diseases	23	30	27	80
		Non-communicable diseases + Adictions	12	30	24	66
		Nutrition and environment	-	-	5	5
		Violence and accidents	-	-	-	-
	Actions	Research in Politics, System and Health Services	-	-	4	4
		Technological Research and Development	19	4	-	23
		Traditional Medicine	-	-	-	-
		TOTAL	54	64	60	**178**

Source: Own Development

This objective can also be analyzed in each of the two sectors we examined: the National University of Asunción, through its Centro de Investigaciones en Ciencias de la Salud – IICS (Health Sciences Research Center) on one hand, and the laboratories belonging to the Ministry of Public Health and Social Welfare (MSPyBS). This information is broken down in Table 3 for IICS and Table 4 for the Ministry. A priori, the *Problems* category does not show an evident focus or dedication between both sectors, but the number of IICS projects -119 dedicated to *Problems*- significantly exceeds MSPyBS's 27. In both cases there is interest in addressing communicable diseases and non-communicable diseases and addictions. Also, we observed a balanced distribution among biomedicine, clinical medicine and public health in both sectors.

Table 3. Distribution of projects by categories (2002-2006) – IICS/UNA

			Research Methodology			
			Biomedical	Clinic	Public Health	TOTAL
Objectives	Context	Socioeconomic - Cultural	-	-	-	-
	Problems	Communicable diseases	11	22	20	53
		Non-communicable diseases + Adictions	12	28	21	61
		Nutrition and environment	-	-	5	5
		Violence and accidents	-	-	-	-
	Actions	Research in Politics, System and Health Services	-	-	4	4
		Technological Research and Development	19	4	-	23
		Traditional Medicine	-	-	-	-
		TOTAL	42	54	50	**146**

Source: Own Development

However, when comparing studies of the *Actions* category (See Table 3 and 4.) -especially biomedical research and technological development- IICS stands out with 23 studies in 2002-2006; thus we may consider it an entity with this specialization.

Table 4. Distribution of projects by categories (2002-2006) – MSPyBS

			Research Methodology			
			Biomedical	Clinic	Public Health	TOTAL
Objectives	Context	Socioeconomic - Cultural	-	-	-	-
	Problems	Communicable diseases	12	8	7	27
		Non-communicable diseases + Adictions	-	2	3	5
		Nutrition and environment	-	-	-	-
		Violence and accidents	-	-	-	-
	Actions	Research in Politics, System and Health Services	-	-	-	-
		Technological Research and Development	-	-	-	-
		Traditional Medicine	-	-	-	-
		TOTAL	12	10	10	**32**

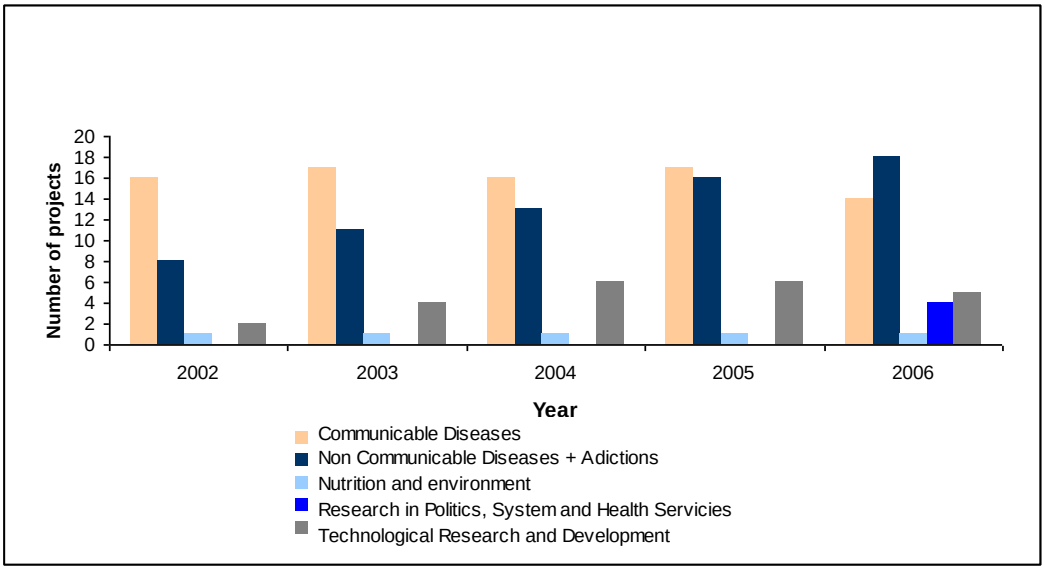
Source: Own Development

In Figure 6 below, 2002-2006 cumulative figures found in Tables 2, 3 and 4 are broken down into year and category. It shows the evolution of the total number of health projects: almost all sectors that Paraguay has addressed tended to grow, with the exception of nutrition and the environment which remained practically static. In 2006, there was manifest interest in researching issues of health policy, systems and services.

Figure 7 shows the evolution of projects developed at IICS at the National University of Asunción, and the importance the university sector ascribes to health research, given that this university alone accounts for practically all of the health research of the 2002-2006 period.

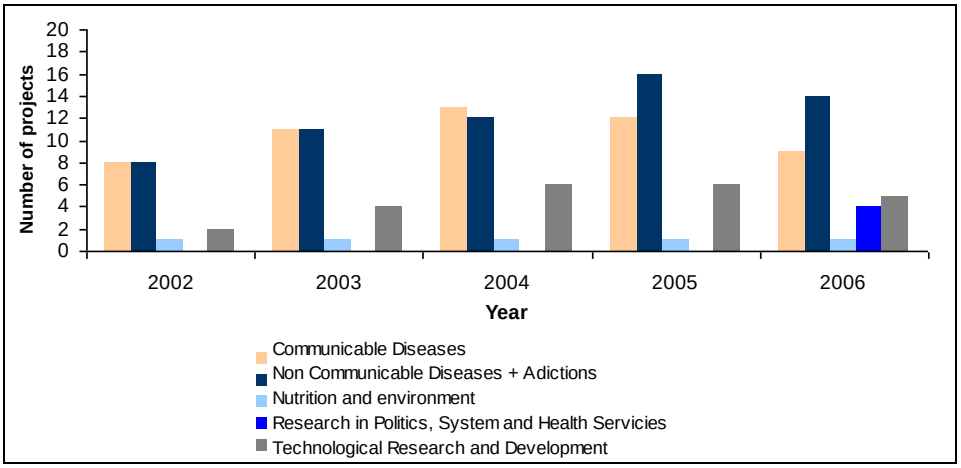
Figure 8, which corresponds to the Ministry of Public Health and Social Welfare projects, highlights its departments' incipient advances in research, as well as the marked interest in area of communicable illnesses, in contrast with non-communicable illnesses and addictions, which is minimum.

Figure 6. Evolution of total number of projects in health, by category and year



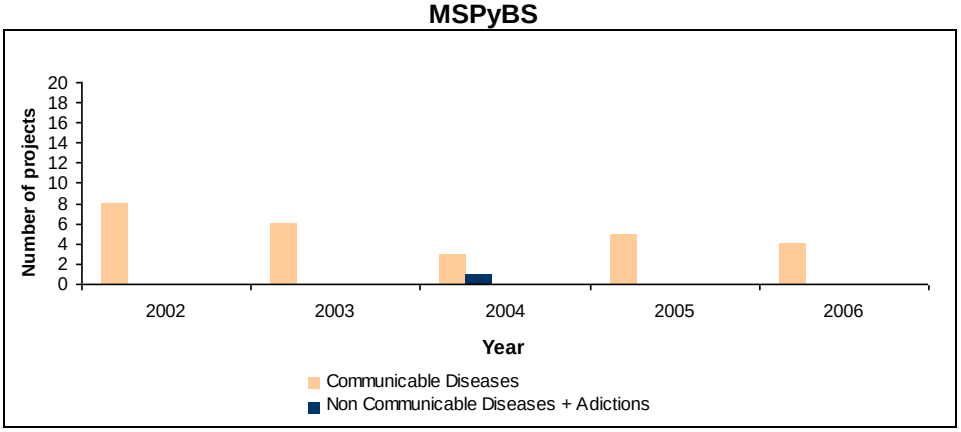
Source: Developed by the author

Figure 7. Evolution of total number of projects in health by category and year IICS/UNA



Source: Developed by the author

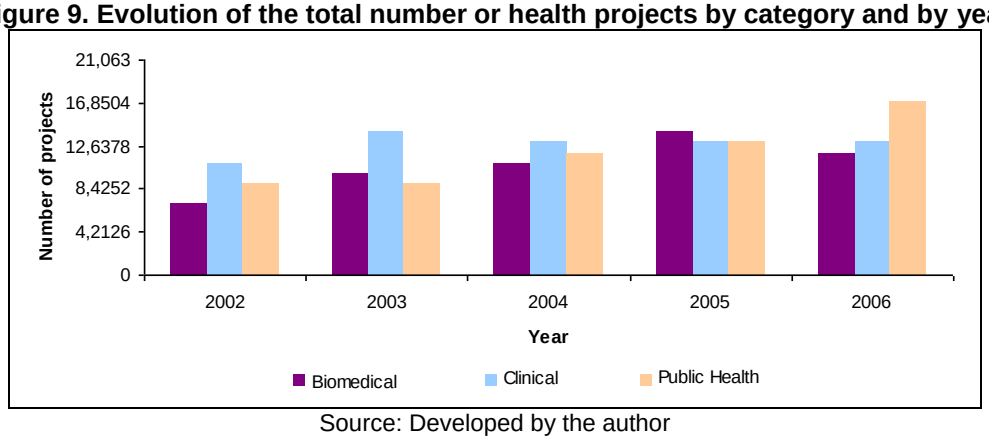
Figure 8. Evolution of total number of projects in health, by category and year MSPyBS



Source: Developed by the author

Figure 9 shows the evolution of projects in the three areas we studied: biomedicine, clinical medicine and public health. The sector that experienced the greatest increase was public health with almost 89%, reaching 17 projects in 2006 up from 9 in 2002. Growth in other areas was less perceptible. Again, IICS explains this evolution as this is not the case with MSPyBS.

Figure 9. Evolution of the total number or health projects by category and by year



Source: Developed by the author

After analyzing the awarding of funds, we observed the following distribution: 54.68% corresponds to IICS/UNA funds and 35.27% to MSPyBS. In both sectors, the bulk of the funds are allocated to communicable diseases (61.7%), the second priority being non-

communicable diseases and addictions (26.3%), and to a lesser extent technological development (8.3%), specifically at IICS/UNA. On the other hand, as it was said before, Paraguay had no project on basic science. This can be seen in Tables 5, 6 and 7.

Table 5. Distribution percentage of expenditure in projects by categories (2002-2006)

			Research Methodology			
			Biomedical	Clinic	Public Health	TOTAL
Objectives	Context	Socioeconomic - Cultural	-	-	-	-
	Problems	Communicable diseases	20,6	15,8	25,3	61,7
		Non-communicable diseases + Adictions	6,0	11,3	9,1	26,3
		Nutrition and environment	-	-	1,9	1,9
		Violence and accidents	-	-	-	-
	Actions	Research in Politics, System and Health Services	-	-	1,7	1,7
		Technological Research and Development	6,9	1,4	-	8,3
		Traditional Medicine	-	-	-	-
		TOTAL	**33,5**	**28,5**	**37,9**	**100,0**

Source: Own Development

Table 6. Distribution percentage of expenditure in projects by categories (2002-2006) – IICS/UNA

			Research Methodology			
			Biomedical	Clinic	Public Health	TOTAL
Objectives	Context	Socioeconomic - Cultural	-	-	-	-
	Problems	Communicable diseases	4,1	12,2	12,4	28,7
		Non-communicable diseases + Adictions	6,0	10,3	7,8	24,1
		Nutrition and environment	-	-	1,9	1,9
		Violence and accidents	-	-	-	-
	Actions	Research in Politics, System and Health Services	-	-	1,7	1,7
		Technological Research and Development	6,9	1,4	-	8,3
		Traditional Medicine	-	-	-	-
		TOTAL	**17,0**	**23,9**	**23,8**	**64,7**

Source: Own Development

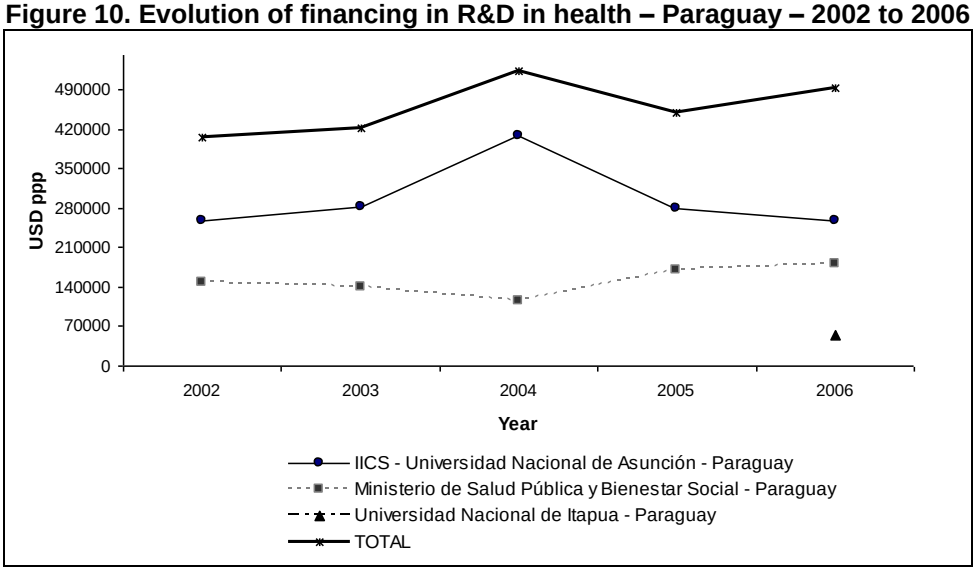
Table 7. Distribution percentage of expenditure in projects by categories (2002-2006) – MSPyBS

			Research Methodology			
			Biomedical	Clinic	Public Health	TOTAL
Objectives	Context	Socioeconomic - Cultural	-	-	-	-
	Problems	Communicable diseases	16,5	3,6	12,9	33,0
		Non-communicable diseases + Adictions	-	1,0	1,3	2,3
		Nutrition and environment	-	-	-	-
		Violence and accidents	-	-	-	-
	Actions	Research in Politics, System and Health Services	-	-	-	-
		Technological Research and Development	-	-	-	-
		Traditional Medicine	-	-	-	-
		TOTAL	16,5	4,6	14,2	**35,3**

Source: Own Development

Figure 10 shows the evolution of health project funding from 2002 to 2006, and the trend towards growth is noticeable. The great rise in IICS's funding of health research, compared to the stagnant position of the Ministry of Public Health and Social Welfare, is remarkable.

Figure 10. Evolution of financing in R&D in health – Paraguay – 2002 to 2006



Source: Developed by the author

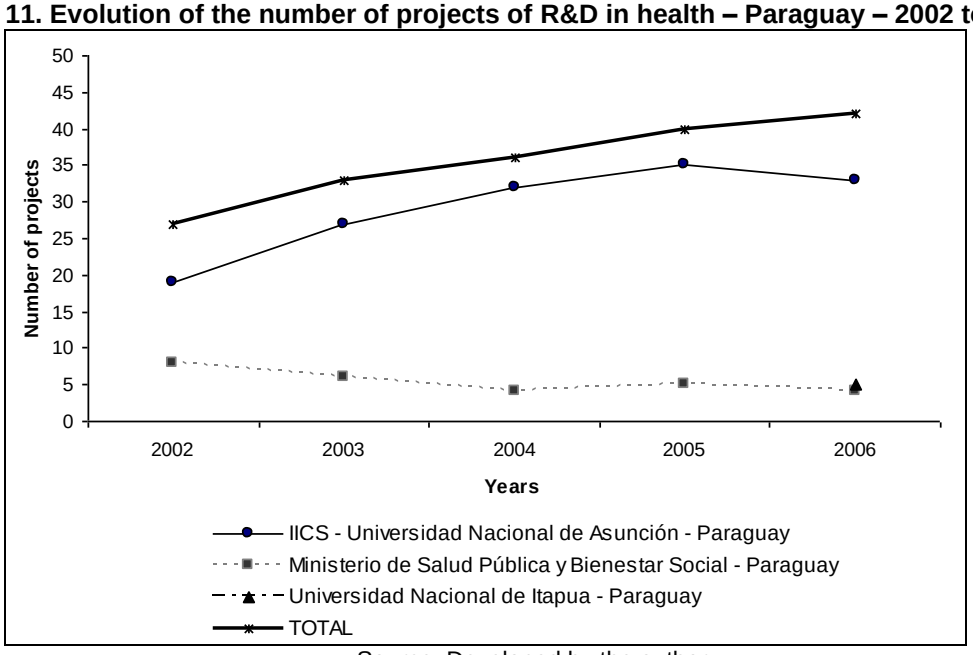
The trend shown in Figure 11 is a rise in the number of health R&D projects between 2002 and 2006. In addition, the significant expansion of IICS's project portfolio markedly contrasts with the Ministry of Public Health and Social Welfare's practically stagnant position since 2002.

Figures 12, 13 and 14 show the percentage of researchers -an average of 125 people- by gender for the period 2002-2006. Overall, there is a predominance of female researchers in the health sector, reaching 82.75%.

This number is heavily affected by the number of women at IICS, where they make up 93.22%, averaging 110 researchers. More equal figures are observed for MSPyBS, yet women are also somewhat predominant (61%), averaging 15 researchers.

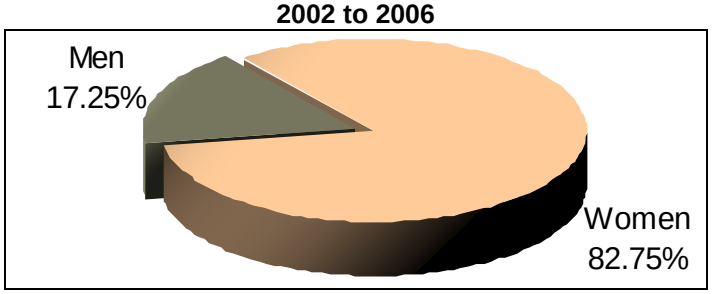
In general, researchers' mean age within the health area is 46.4 years old. At IICS, the average is 48.2 and at MSPyBS, 41.6.

Figure 11. Evolution of the number of projects of R&D in health – Paraguay – 2002 to 2006



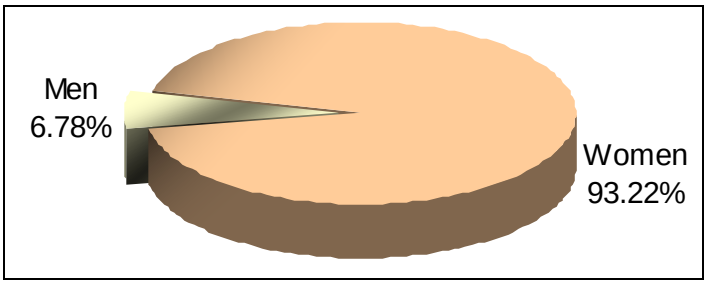
Source: Developed by the author

Figure 12. Percentage of researchers by gender in the health sector – Paraguay – 2002 to 2006



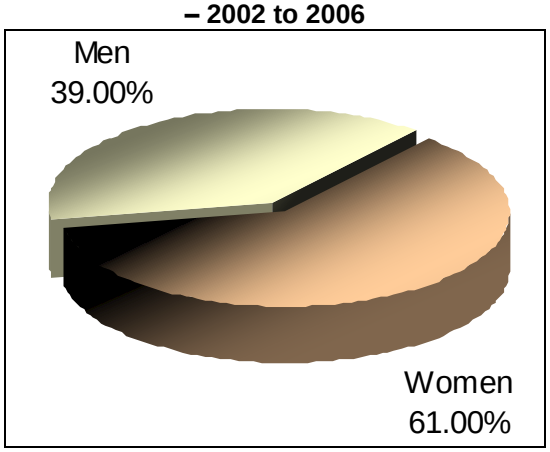
Source: Developed by the author

Figure 13. Percentage of researchers by gender in the health sector at IICS/UNA – Paraguay – 2002 to 2006



Source: Developed by the author

Figure 14. Percentage of researchers by gender in the health sector at the MSPyBS – Paraguay – 2002 to 2006



Source: Developed by the author

8. Conclusion

The purpose of this report is to contribute towards a direction of study that could potentially be used as a tool in the public policy decision-making, particularly in revising the national agenda for health research. Although private sector research (which in the case of Paraguay is significant) was not considered, this study is a good approximation towards assessing what is being done in terms of health, especially the public sector.

For this reason, throughout this report we analyzed two large, significant segments: on one hand, the academic sector -represented by the National University of Asunción and its Health Sciences Research Center- and the Ministry of Public Health and Social Welfare -with its research laboratories- on the other.

The main conclusions arising from this study may be that there is a upward trend in the allocation of funds for publicly-run health research; as well as the existence of a strong focus

on Asunción and the Central Department region, in addition to the recently originated hub at Itapúa National University.

This study did not identify a specific specialization among institutions, but rather a marked difference between the number of projects developed by the National University of Asunción and by the Health Ministry- the University accounts for almost all health research activity in Paraguay.

The research activities in Paraguay that have had more international visibility in the later years, are those that cover the areas of health. A bibliometric study developed by the CONACYT in the year 2.006 revealed this situation[53]. The study of the projects developed between 2002 and 2006 in the areas of health, revealed that public research focused mainly in areas of communicable diseases such as: Dengue, Visceral Leishmaniasis, Chagas Disease, Hantavirus and Zoonosis.

There is likely to be a quantitative and qualitative shift with the work of the Consejo Nacional de Ciencia y Tecnología – CONACYT (National Council of Science and Technology through its Research and Innovation Support Program, which began in 2007 and is not covered in this study. Among other things, this program will support and finance research and innovation in health. Consequently, in subsequent studies, Paraguay is expected to present a more favorable situation as compared to other Latin American countries.

[53] Duarte Masi, S. (2006), "*Bibliometric indicators of Paraguay*" in "Investigación Ciencias de la Salud, Vol. 4", Consejo Nacional de Ciencia y Tecnología (CONACYT). Asunción-Paraguay. June 2006.

Public Health Research Funding: The Uruguayan Case

Delia M. Sánchez, MD, MPH

1. Introduction: Economic and health background

Uruguay is a small country located in the Southern Cone of South America. Its GDP per capita was 9,962 US$ PPP in 2007. The country's economy suffered a severe fall in 2002, from which it is recovering.

A United Nations report that divides Uruguay's recent economic history into three stages, estates that from 1985 to 1994 the country's economy grew and poverty rates fell from 46.2% to 15.3%. Between 1995 and 1998 there was stagnation and social indicators worsened, while between 1999 and 2004 the country suffered the impact of the second most important economic crisis in its modern history, with poverty levels doubling from 15,3% to 32,1%, while absolute poverty rose from 1.2% to 4% of the total population.[54]

During the 1990's Uruguay's Human Development Index (HDI) ranked from 37 to 40 among the 174 countries for which it is measured, and it went down to 46 in 2002[55], a position that remained unchanged in the 2006/2007 report[56].

1.1. Demographic situation

Table 1, which contains relevant demographic data for Uruguay[57], shows a population with high life expentancy at birth, low fertility rates and a relatively high crude death rate, due to the aging of its population. As far as age distribution is concerned, the 80 years and older group accounts for 3.2% of the total population.

Table 1. Selected demographic indicators, Uruguay, 2007

Total Population	3.241.003
Life Expectancy at Birth	75.85 years
Crude Birth Rate	14.3‰
Crude Death Rate	10.3‰
Illiteracy Rate	3.21%
Global Fertility Rate	2.02
Annual Population Growth Rate	3.05%

Source: INE. Datos demográficos. Access on 11/3/08. http://www.ine.gub.uy/

These data, analyzed together with the main causes of death (see further down) stress the fact that Uruguay has completed its demo-epidemiological transition (Omran, 1971). This

[54] UNDP. Análisis Común de País (CCA). Septiembre 2005.
[55] UNDP. Desarrollo Humano en Uruguay 2005. Montevideo: PNUD; 2005.
[56] UNDP Human Development Report 2006/2007. Available on line in : http://hdrstats.undp.org/countries/country_fact_sheets/cty_fs_URY.html
[57] Uruguay. Instituto Nacional de Estadística. 2005. Available on line in: http://www.ine.gub.uy/

phenomenon occurred in Uruguay several decades earlier than in the rest of Latin America.[58] Nevertheless, the increase in the numbers of population living in poverty, particularly in the younger age groups, raises the possibility of an increase of those conditions traditionally related to poverty, such as infectious and parasitic diseases.

1.2. Health situation

Considering its sensitivity both to socio-economic conditions and to the actions of health systems, infant mortality information is presented first. The main causes of infant mortality are those related to prematurity and congenital diseases, which is the reason for neonatal mortality being continually higher than post-neonatal mortality.

Table 2. Infant, Neonatal and Post-neonatal Mortality. Uruguay. 1990, 2000-2007

Year	Infant Mortality rate	Neonatal Mortality rate	Post-Neonatal Mortality rate	Under 5 Mortality rate
1990	20,4	11,5	8,9	23,6
2000	14,06	7,89	6,16	
2001	13,88	7,95	5,93	16,3
2002	13,62	7,94	5,67	
2003	15,02	8,29	6,73	14
2004	13,2	7,73	5,47	
2005	13			
2006	10,5			
2007	11,9	6,66	5,4	

Rates per thousand live births
Sources: 1990, 2000-2003: Uruguay. Instituto Nacional de Estadística. 2004-2007:MSP. Unidad de Estadística.

Differences in health status within the country are large, but not well documented, except those on differences in infant mortality indicators.

The main causes of death in 2007 were ischemic heart disease, cancer, traffic accidents and suicide. This profile shows the importance of life-style related factors, as well as population aging. Although the main risk factors for several of these diseases are known and preventable, no significant progress has been achieved in their control.

Furthermore, healthy years of life lost by large chapters of the International Classification of Diseases Nº 10 (ICD- 10) in 1981 (only available data)[59], showed that the first five causes for males were cardiovascular diseases, malignant neoplasms, accidents, neuro-psychiatric diseases and neonatal disorders. As for females, the first three causes were the same, while the fourth and fifth places were congenital anomalies and neuro-psychiatric diseases, respectively.

Uruguay has good conditions of prevention, surveillance and control of communicable diseases, with high percentage of coverage of vaccines, success in the control of regional pathologies (Chagas and Hydatid disease) and actions in the field of emergent diseases (Hantavirus, leptospirosis, etc.) and potentially introducible (dengue/aedes aegypti, encephalitis) or reintroducible diseases (rabies).

[58] Calvo, JJ La población del Uruguay en las próximas décadas Una visión, dos escenarios y diez preguntas para debatir. Estrategia Nacional para la Infancia y la Adolescencia (ENIA) 2008. Available on line in http://www.enia.org.uy/pdf/Sustentabilidad%20DEMOGRAFICA.pdf

[59] Caracha, O. *Años de vida saludables perdidos en Uruguay*- FISS/MSP, 2001.

The total age adjusted mortality rate for communicable diseases in 2003-2005 was 40.3 per 100.000 inhabitants, significantly lower that the one for Latin America as a whole, which showed an average rate of 74.4 per 100.000.[60]

Although communicable diseases are not amongst the main causes of death nowadays, they may have a negative incidence in morbidity and contribute to a descent in the quality of living, particularly for those populations known to be at risk.

1.3. Health Sector Structure

The provision of health services is historically divided in two sectors (public/private) with population coverage of almost similar sizes.

The public sector offers free services to the population of low socio-economic resources (State Administration of Health Services – ASSE- and Clinicas Hospital, belonging to the University of the Republic), to closed populations of specific labor categories (Military and Police Health Services) and to workers in general in case of accidents and professional diseases (State Insurance Bank)

The private subsector is formed mostly by Institutions of Collective Medical Care (IAMC). IAMCs are comprehensive not for profit insurance schemes, with a long tradition in the country. They may be mutual aid societies, medical cooperatives or be associated to medical unions.

The private sector as such (for profit) is limited in terms of the numbers of comprehensive providers, but significant as suppliers of specialized services to other actors in the system, both public and private.

Total health expenditure in the past two decades has ranged from 9 to 11% of GDP.

An important health sector reform took place in 2007, inscribed in a series of gradual change policies. Moreira y Fernández[61] identified seven moments in this reform process:

1. Agreements of the National Programmatic Concertation (1984)
2. Creation by Law of the State Health Services Administration (ASSE) (1987)
3. Proposal of ASSE Decentralization Law by Minister Alfredo Solari in the framework of the Budget Law. (1995)
4. Reconfiguration of ASSE and policies to regulate private activity
5. Application of the State Administrative Reform at the Ministry of Public Health.
6. Reform options formulation.
7. Current reform

Different authors have stressed the importante of the wellfare state concept to understand Uruguayan political processes and the history of health sector reform is not alien to this phenomenon.

[60] PAHO. Health Conditions in the Americas. Basic Indicators 2008.

[61] Moreira, C. y Fernández, J., 1997. *Políticas de Ajuste en el Sistema Público de Salud: Una Visión desde los Agentes*. Documento de Trabajo 202. Montevideo: Centro de Informaciones y Estudios del Uruguay/Organización Panamericana de la Salud/Consejo Latino Americano de Ciencias Sociales.

The main instruments of the present reform are Law 18.131, that created the National Health Fund, in May 2007 and Law 18.211 on the National Integrated Health System. These, together with the law to decentralize ASSE, conform a new model of funding and access to services, without modification of the property or organizational structure of health care providers.

2. Health research in Uruguay

2.1. Health research production

Publications

As shown in Table 3, the participation of Uruguayan publications in BIOSIS and MEDLINE bases from 1990 to 2005 was very low, never higher than 0.03% of the world total, according to data obtained from the web page of the Iberoamerican Network of Science and Technology Indicators (RICYT). Nevertheless, there is a difference in their behavior: while the number of publications indexed in BIOISIS stayed relatively constant from 1990 to 2003, publications indexed in MEDLINE, which were only 48 in 1990 (0.009% of the world total) increased continuously, reaching 0.026% of the world total in 2003. In the years 2004 and 2005 Uruguayan publications in both bases showed a sharp decrease, perhaps as a consequence of the economic crisis of 2002.

Besides publication biases, which have already been discussed by many authors, we may assume that given the different profile of these bases, one more oriented toward basic science and the other towards clinical research and health in general, we might be facing two scientific communities with different degrees of consolidation and international presence. Nevertheless, available data is not enough to explain what were the factors that intervened in the first 13 years of the period to triple the number of papers in MEDLINE, nor if this is a consequence of a real increase in health research, a change in publishing strategies of national researchers, or the inclusion of new journals in the before-mentioned bases.

Table 3. Participation of Uruguayan papers in BIOISIS y MEDLINE. 1990-2005*

	Nº in Bioisis	% of World Total	Nº in Medline	% of World Total
1990	131	0,024	48	0,009
1991	114	0,021	31	0,006
1992	137	0,026	49	0,009
1993	157	0,03	45	0,009
1994	135	0,025	56	0,014
1995	134	0,025	55	0,014
1996	156	0,028	74	0,018
1997	195	0,036	87	0,021
1998	184	0,036	96	0,023
1999	158	0,031	85	0,022
2000	174	0,03	115	0,024
2001	177	0,032	118	0,023
2002	192	0,034	126	0,024
2003	171	0,03	148	0,026
2004	47	0,01	35	0,01
2005	64	0,01	30	0

Source: Ellaborated by the autor based on data from BIOSIS and MEDLINE.
*RICYT data: www.ricyt.edu.ar 30/10/2008

2.2. Health research institutions

University of the Republic

The School of Medicine at the University of the Republic is the main producer of health research in the country. There is a research promotion policy with funding provided or administered by the Manuel Pérez Foundation. Nevertheless, the School has not developed a research priority agenda and projects respond to the intellectual curiosity and demands of researchers.

In a survey carried out in 2002 by the Scientific Research Sectoral Commission (SCIC, the University of the the Republic's research promotion agency), the School of Medicine identified 26 active research groups, none of them from the Dpt of Preventive and Social Medicine, which is the one in charge of Epidemiology, health systems research and technology assessment. Except for Psychiatry and Oncology, most groups involved in clinical research were also excluded. Since the methodology involved self-definition as a researcher, these omissions show a problem in researchers' self-perception, maybe related to a different value attached to basic vs clinical and health policy and systems research

Of these 26 self-identified groups, 9 work in Neurosciences and Physiology, 5 in Pharmacology and two in Oncology. Their main sources of funding were CSIC and the National Scientific and Technical Research Council (CONICYT). Only 7 groups reported to receive foreign funding.

Other schools in the University of the Republic also perform research in or for health. Among them, the School of Science, with 11 groups of active researchers in Biomedicine and the Schools of Chemistry, Psychology, Social Sciences, Humanities and Educational Science, and Odontology.

Clemente Estable Institute for Biological Research (IIBCE)

The Institute, which is a dependence of the Ministry of Education and Culture, has 19 research units grouped in four large areas: Neurosciences, Agrarian Biotechnology, Environmental Sciences and Biomedical Sciences. Over half of the Institute's human resources are concentrated in the area of Biomedicine. IIBCE has 19 full-time researchers and 117 part-time ones, besides honorary collaborators.

The Institute's research lines are defined by the researchers and funding is obtained from national competitive funds: the Program for Technological Development (PDT), the Clemente Estable Fund (FCE), the Scientific Research Sectoral Commission (CSIC), the National Institure for Agricultural Research (INIA) and international sources: National Institutes of Health (NIH), Wellcome Trust (WT), The Academy of Sciences for the Developing World (TWAS) and the International Atomic Energy Agency.

Private research centers

Private research centers play a key role in the field of public health research, particularly health policy and systems research. They include the Uruguayan Center of Information and Studies (CIESU), the Center for Economic Research (CINVE), the Latin american Center of Human Economics (CLAEH) and the Group of Studies in Economics, Organization and Social Policies (GEOPS), among others.

3. Health research Promotion and Funding Structure

The national health research promotion and funding structure includes the National Research and Innovation Agency (ANII), The Direction of Innovation, Science and Technology for Development (DICYT) of the Ministry of Education and Culture, the National Research, Science and Technology Council (CONICYT) and the Scientific Research Sectoral Commission (CSIC) of the University of the Republic

The **Innovation Ministerial Cabinet**, which is the upper echelon, includes the Ministries of Education and Culture, Economics and Finances, Industry, Energy and Mining, Livestock, Agriculture and Fishing and the Director of the Planning and Budget Offices. Its main objective is to coordinate and articulate governmental actions related to Innovation, Science and Technology activities for development

The **National Research and Innovation Agency (ANII),** created by Budget Law 2005-2009 (art 256 of Law Nº 17.930 of December 19, 2005) functions as a public non-state person, designed as a relatively small and agile organization. Its main objectives include drawing, organizing and administering plans, programs and instruments geared to scientific-technological development and the deployment and strengthening of innovation capabilities. Another objective is to foster the relationship and coordination between knowledge producers and users.

According to Art 6 of the law that created it, its direction and upper administration are in the hands of a Board that includes seven members appointed by the Executive, five of them proposed by the Innovation Ministerial Cabinet, who rotate at the Chair, and two proposed by the National Innovation, Science and Technology Council (CONICYT). In case of even votes on any subject, the Chair's vote counts twice.

The **Direction of Innovation, Science and Technology for Development (DICYT),** belongs to the Ministry of Education and Culture and was created in 2001 with the goal of drawing and fostering that Ministry's policies, guidelines, strategies and priorities in the field of innovation, science and technology. It was also created with the aim of articulating the Ministry's actions with those of other branches of the Executive, as well as with other public and private entities directly or indirectly related to those policies, functioning as the system's support in matters of technical ellaboration, assessment and follow-up and the generation of information relevant for decision making. Managing the National Researchers Fund and the Clemente Estable Fund is also among its objectives

The **National Innovation, Science and Technology Council (CONICYT),** whose functions had been defined by Law 17296 of February 21, 2001 and were modified by Law 18084 of January 9, 2007, is formed by representatives of different organizations related to science, technology and innovation: five representatives of the Executive, one representative of Government agencies included in Art 221 of the Constitution, seven representatives of the academic-scientific sector (four of them appointed by the University of the Republic, one active researcher elected by his peers from those within the system and two appointed by the private universities); five representatives of the productive sector, appointed by representative chambers; one representative of the National Council of Local Authorities, one representative of the workers, appointed by PIT-CNT (the national workers' union); one representative of ANEP (the agency in charge of public education) and its President, chosen by the Council itself. Its main functions are:

- To submit to the Innovation Ministerial Cabinet, the Executive and Legislative, plans, general policy guidelines and priorities related to Science, Technolology and Innovation. In particular, its previous opinion is requested on the National Strategic Plan on Science,

Technolology and Innovation (PENCTI), ellaborated by the Innovation Cabinet, as well as on the plans and programs to be implemented by the ANII.

- To draw proposals of bases and guidelines, areas of interest and policy instruments on science, technology and innovation.
- To propose the creation and normatization of science, technology and innovation programs.
- To promote and foster the development of research in all areas of knowledge.
- To promote actions conducive to strengthening the National Science, Technology and Innovation system.
- To follow up the functioning of different programs of the National Research and Innovation Agency, particularly the PENCTI.

The **Scientific Research Sectoral Commission (CSIC),** of the University of the Republic is an organ of university co-rule created in 1990 with the objective of comprehensively promoting research at the University through the implementation of a variety of programs. It is formed by delegates of the University orders (students, teachers, graduates) and the knowledge areas (agro-veterinary, artistic, health, social) and is headed by a delegate of the Central Directive Council of the University, who has the position of Research Pro-rector and President of CSIC.

4. Research Funding Instruments

The **National Researchers Fund (FNI)**[62] was created by Law Nº 16.736 (Art.388) of the National Budget approved on January 5, 1996. Its objective is "to foster scientific, technological and cultural research in all areas of knowledge" and is destined to highly dedicated active researchers living in the country. It is administered by an Honorary Commission headed by the Minister of Education and Culture and formed by the Rector of the University of the Republic and the President of CONICYT. Since 2005 it is included in the same buget line as the Clemente Estable Fund.

The FNI made calls on 1999 and 2004:

- The first call was managed by CONICYT. It was destined to cover 40 positions of Level III researchers, 60 of Level II and 35 of Level I.
- The 2004 call was managed by DINACYT and offered 30 positions of Level III researchers, 80 of Level II and 120 of Level I.
- Annual stipends were set as follows: Level III, $U 60.000 (4.418 US$ PPP); Level II, $U 50.000 (3.682 US$ PPP); Level I, $U 40.000 (2.945 US$ PPP) .
- In the 1999 call only one researcher from the health field was approved (2% of the total number) and in 2004, 79 health area researchers were included (34% of the total).
- It must be pointed out that these are not research projects but support to research careers in the different areas of science, technology and culture.

[62] Information available on line in :
http://www.dicyt.gub.uy/index.php?option=com_content&task=view&id=69&Itemid=100

The **"Profesor Clemente Estable" Fund (FCE)**[63] is a research support program created in 1996 and funded from the national budget. It funds research projects in all areas of knowledge through open calls to researchers from public or private not-for-profit institutions.

The **Technological Development Program (PDT)**[64] is carried out by DICYT. It is a five year long program funded by a 20 million US dollars loan of the Inter-American Development Bank and 6.67 million US dollars of local contribution. It consists of three sub-programs:

Subprogram I - "Support to Innovation and Competitiveness Improvement of Enterprises" supports individual enterprises through non refundable co-funding of no more than 50% of the cost of innovation projects (in products or processes), management or quality, that improve competitiveness, profitability and productivity of small and medium size Uruguayan enterprises

Subprogram II - "Science and Technology Development and Application" aims to increase the scientific and technological knowledge generating capacity in pre-identified areas of social and economic interest. Beneficiaries are public and private not-for-profit research and development centers. It funds research projects and post-graduate studies abroad. Until 2004 it made calls in the following areas of opportunity: Food technologies, Non-food related agroindustries, Use and conservation of aquatic resources, Use and conservation of natural resources, Information technologies, Energy, Transports and logistics. Only in 2006 did it make a call in the Health area

Subprogram III - "Institutional Strengthening of the National Innovation System" has the objective of coordinating science and technology activities with a systematic approach to innovation, to foster regional and international links and to disseminate scientific and technological advances to the community.

CSIC[65] Competitive Funds

Projects linked to the Productive Sector

These calls have three different modes:

- **Mode 1:** Joint Projects between the University and the Productive Sector, where the latter makes contributions in cash.
- **Mode 2:** University Initiative Projects. Their objective is to strengthen the capacity to relate with the Productive Sector. Under this mode a project in the Health Thematic Area was funded in 2002 (out of 24 funded) with $U 400.000 (35.758 US$ PPP) and three more were funded in 2004 (out of 30 funded) with $U 1:199.326 (107.216 US$ PPP).
- **Mode 3:** Exchange with the Productive Sector. It funds research fellowships in different areas of the national Productive Sector and the University of the Republic.

Research and Development Program

[63] Information available on line in:
http://www.dicyt.gub.uy/index.php?option=com_content&task=blogcategory&id=0&Itemid=81&PHPSESSID=2a1735191eb84e67753ba1c8ff214462

[64] Information available on line in : http://www.dicyt.gub.uy/pdt/pdt.html

[65] J. Sutz (coordinadora) CSIC en cifras. Available on line in:
http://www.csic.edu.uy/CSIC%20en%20cifras/PORTADA.htm

The R&D program's objective is to foster and strengthen research in all areas of knowledge and disciplines. Seven calls have been made (1992, 1994, 1996, 1999, 2001, 2004 y 2006) for competitive funding.

All these calls covered two modalities: Research Initiation and Research and Development. In 2000 only Research Initiation projects were called for and in 2006[66] three modalities were allowed: R&D, Initiation Mode 1 (for young teachers at the University of the Republic) and Initiation Mode 2 (for young people facing their first research experience), with maximum sums of $U 500.000 (36.414 U$S PPP), $U 300.000 (21.848 U$S PPP) and $U 130.000 (9467U$S PPP) respectively. The call was expected to fund 80 R&D projects, 37 Initiation Mode 1 and 41 Initiation Mode 2 projects.

5. Methodology

National research funding agencies were requested to provide information on research projects in the "biomedicine", "medicine" or "health" categories funded with the instruments listed above and that were called and allocated between 2002 and 2006. Information was provided directly by DICYT for the Clemente Estable Fund and the PDT projects, and gathered from the institutional web page in the case of CSIC.

No results are included for the National Researchers Fund because its mechanism is not that of call for projects. The Ministry of Health does not have any specific research fund, so it is not included. Nevertheless, it carries out research in different areas, with its operational resources.

121 funded projects were identified using these criteria. Because of the times when calls were made (as described above) no projects funded in 2002 or 2003 were identified.

Data gathered include: name of researcher, name of Project, amount funded (in Uruguayan pesos), year, funder, and type of call. Funding was converted into constant PPP US dollars. Based on the name of the project, each one was included in one of 25 categories according to research methodology and research problem, including an extra category for basic research.

There was no exact data on CSIC funding for each project in the year 2004, but the agency has a ceiling by category and based on historical experience, it was assumed that each funded project received the highest available amount, hence the repetition of figures, be it for Research Initiation or Research and Development (the category for consolidated researchers)

No information was provided on researchers' age, since it is not available for third parties in the funders data bases. In the CSIC calls, one may assume that initiation calls are allocated to young researchers and research and development projects to older ones, but it is really academic background that is judged, not the researcher's age.

Data on the different funders and projects was entered in an Excel data sheet and analyzed using the SPSS 16 software. Variables studied were the same used by Maceira and Peralta Alcat in their paper on Public Health Research in Argentina[67], which are explained in depth in

[66] CSIC. Informe sobre la resolución del llamado a Proyectos de I+D 2006 de la Comisión Sectorial de Investigación Científica. Available on line in : http://www.csic.edu.uy

[67] Maceira, D. y Peralta Alcat, M. El financiamiento público de la investigación en salud en Argentina. FISA. Argentina, 2007.

the joint paper on health research funding in Argentina, Chile, Paraguay and Uruguay, of which this paper is a part.

6. Results

Since the different agencies do not make calls for projects every year, during the study period data was obtained only for projects approved in the years 2004, 2005 and 2006. Most projects correspond to years 2004 and 2006 (52 and 62 projects, respectively).

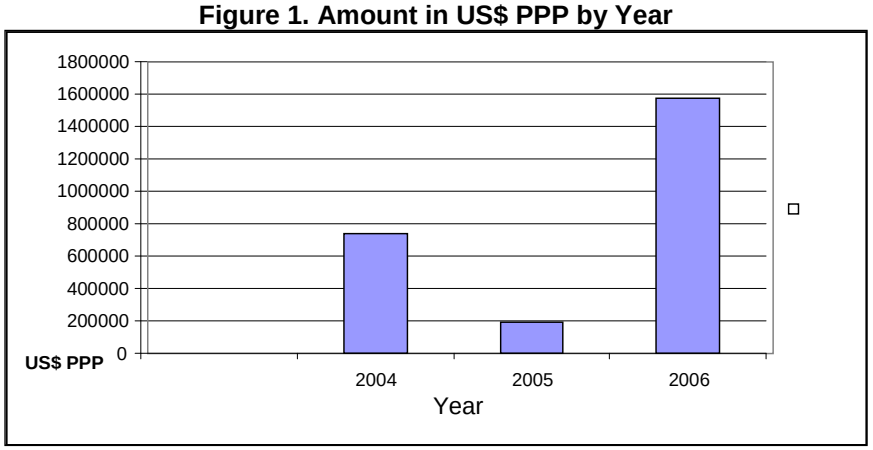
Table 4 shows a summary of the projects identified according to the 25 categories, including the number of projects in each one, and the amount of funding in US dollars PPP by year. The small funding available for research in 2005 seems to accompany the decrease in the number of Uruguayan publications in the same year. The amount available in 2006 was more than twice the amount allocated to health research in 2004 (See Fig. 1) and the call made by PDT in the area of opportunity “Health” is relevant when accounting for that difference.

Table 4. Number of Projects and Amount by Category and by Year. 2004 to 2006

	2004		2005		2006	
Category	Nº projects	USD (PPP)	Nº projects	USD (PPP)	Nº projects	USD (PPP)
1(basic)*			1	34.648	1	36.268
2 (biomed/ soc- ec)						
3 (clinical/ soc-ec)						
4 (pub health /soc-ec)	5	77.323			3	58.283
5 (biomed/ comm)	8	119.298	3	88.220	9	164.256
6 (clinical /comm)	1	17.674				
7(pub health/ comm)					1	22.289
8 (biomed/ non comm)	14	214.295	2	37.519	27	745.617
9 (clinical/ non comm)	12	189.994			12	321.498
10 (pub health/ non comm)	4	37.555			3	94.757
11(biomed/ nutr.)					1	36.395
12 (clinical/ nutr.)					1	28.818
13 (pub health/ nutr.)	1	6.627				
14 (biomed/ viol.)						
15 (clinical/ viol.)						
16 (pub health/ viol)	1	17.674				
17(biomed/ pol and syst)						
18 (clinical/ pol and syst)						
19 (pub health/ pol and syst)	3	30.928			1	6.876
20 (biomed/ tech dev)	1	6.627	1	34.481	3	56.230
21(clinical/tech dev)						
22 (pub health/ tech dev)						
23 (biomed/ trad)	1	17.674				
24 (clinical / trad)	1	6.627				
25 (pub health/ trad)						
TOTAL	52	742.29	7	194.904	62	1:571.287

Source: Developed by the author
Note: * Basic science projects were not able to distribute among research methodology.

Figure 1. Amount in US$ PPP by Year



Source: Developed by the author.

Projects were found in only 16 of the 27 categories, 35.2% of them in biomedical research of non communicable diseases, followed in frequency (19.7%) by clinical research on non communicable diseases and in the third place (16.4%) by biomedical research on communicable diseases, as may be seen in Table 5. In the case of research on basic science, only two projects were identified. None of the projects was meant to be performed out of the country's capital city.

Table 5. Frequency and Percentage of Projects by Category. Years 2002 to 2006

			Type of research						
			Biomedical		Clinical		Public Health		TOTAL
			No.	%	No.	%	No.	%	No.
			-						
	Context	Socio-Economic-Cultural	-				8	6,6	8
	Problems	Communicable diseases	20	16,4	1	0,8	1	0,8	22
		Non—Communicable diseases +Adictions	43	35,2	24	19,7	7	5,7	74
		Nutrition and Environment	1	0,8	1	0,8	1	0,8	3
OBJECTIVE		Violence and Accidents	-	-	-	-	1	0,8	1
	Actions	Health Policy, Systems and Services Research	-	-	-	-	4	3,3	4
		Research and technological development	5	4,1	-	-	-	-	5
		Traditional medicine	1	0,8	1	0,8	-	-	2
		Basic Science*							2
	TOTAL		70	-	27	-	22	-	119

Source: Developed by the author.
Note: * Basic science projects were not able to distribute among research methodology.

According to the information in Table 6, CSIC is the main funder of health research projects, at least regarding the number of projects, which reached 77, while the FCE only funded 10 and the PDT 34 during the period under study, which is coherent with the FCE's emphasis in basic research and with the fact that only in the year 2006 did the PDT include Health as an area of opportunity.

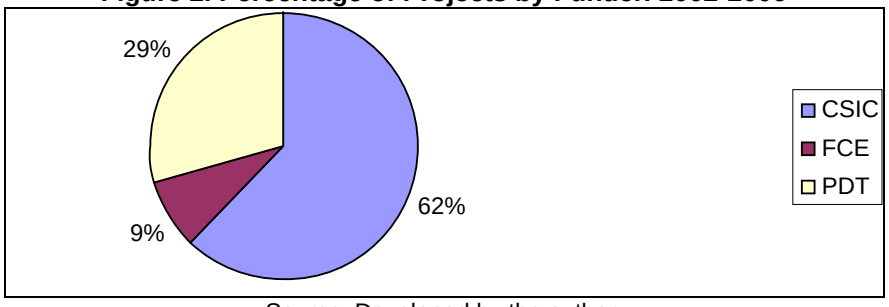
Although CSIC funded projects in 15 of the 25 categories, this agency's funding was also devoted mainly to biomedical research of non communicable diseases, clinical research in non communicable diseases and biomedical research of communicable diseases. The other two funders showed much greater concentration of categories.

Table 6. Number of projects by category and funder. 2004 a 2006

			Type of research										TOTAL
				Biomedical			Clinical			Public health			
			PDT	CSIC	FCE	PDT	CSIC	FCE	PDT	CSIC	FCE	PDT	No.
	Context	Socio-Economic-Cultural	-	-	-					7	1		8
	Problems	Communicable diseases	-	-	10	3	7	1	-			1	22
		Non-communicable diseases +Adictions	-	-	24	5	14	19	5	5	1	1	74
		Nutrition and Environment	-	-	1	-	-	1	-	1			3
OBJECTIVE		Violence and Accidents	-	-	-		-	-	-	1			1
	Actions	Health Policy, Systems and Services Research	-	-	-		-	-	-	4			4
		Research and technological development			1		4	-					5
		Traditional medicine	-	-	1	-		1	-	-		-	2
		Basic Science*	-	2			-		-	-		-	2
		TOTAL	-	2	37	8	25	22	5	18	2	2	119

Source: Developed by the author.
Note: * Basic science projects, both funded by PDT, were not able to distribute among research methodology.

Figure 2. Percentage of Projects by Funder. 2002-2006



Source: Developed by the author.

Regarding the importance of each funder according to the amounts offered, table 7 shows that the PDT' average was 20.731 US dollars PPP, while it was 19,553 for FCE and 17,953 for CSIC. The average amount of all projects was 20.731 US dollars PPP.

Table 7. Average amount of research grants by Funder. 2004-2006

Funder	Number	Average amount US$ PPP	Standard deviation
CSIC	77	17.953,94	10.125,09
FCE	10	19.553,20	5.764,22
PDT	34	27.367,71	12.507,38
Total	121	20.731,30	11.312,96

Source: Developed by the author.

Regarding sex distribution of researchers, Table 8 shows a 10% difference in favor of females. When analyzed by project category (Table 9) a greater concentration of male researchers is shown in clinical research, while females are the majority in the remaining categories.

Table 8. Distribution of Researchers by Sex. 2004-2006

Sex	Frequency	Percentage
Female	64	52,9
Male	51	42,1
Both	6	5
Total	121	100

Source: Developed by the author

Table 9. Distribution of Researchers by Sex and Category. 2004-2006

Category	Female	Male	Both	Total
C1(basic)*	2	0	0	2
C4 (pub health/ socio ec)	5	1	2	8
C5 (biomed/ commun)	11	9	0	20
C6 (clinical/comm)	0	0	1	1
C7 (pub health/comm)	1	0	0	1
C8 (biomed/non comm)	24	18	1	43
C9 (clinical /non comm)	3	19	2	24
C10 (pub health/non comm)	6	1	0	7
C11(biomed/nutrition)	1	0	0	1
C12 (clincal/nutrition)	1	0	0	1
C13 (pub health /nutriton)	0	1	0	1
C16 (pub health /violence	0	1	0	1
C19 (pub health/pol, systems & serv	4	0	0	4
C20 (biomed/tech dev)	5	0	0	5
C23 (biomed/traditionall)	0	1	0	1
C24 (clinical/traditional)	1	0	0	1
Total		51	6	121

Source: Developed by the author.

Note: * Basic science projects were not able to distribute among research methodology.

Table 10 shows a summary of the information on the 62 health research projects approved in 2006. Although the amount of money allocated that year was significantly more than that of previous years, there are no relevant differences regarding main categories, nor the predominance of women among researchers, except in the case of clinical research of non-communicable diseases (where they are only 18% of researchers) and biomedical research on communicable and non-communicable diseases where they are 44 and 48% respectively. In Tables 11 and 12 we may see in greater detail the weight of each category in the number of projects approved and the funding obtained during that year. Biomedical research covered 64% of all projects approved in 2006 and a similar percentage (65%) of the available money.

Table 10: General Information on Projects Approved in 2006 by Category

CATEGORY	Nº	% of projects	USD (PPP)	% female	Age	% capital
1(basic)*	1	1,6	36.268	100	Not available	100
4 (pub health/socio ec)	3	4,8	58.283	100	idem	100
5 (biomed /comm)	9	14,5	164.256	44	idem	100
7(pub health / comm)	1	1,6	22.289	100	idem	100
8 (biomed /non comm)	27	43,5	745.617	48	idem	100
9 (clinical/ non comm)	12	19,3	321.498	18	idem	100
10 (pub health/ non comm)	3	0,4	94.757	100	idem	100
11 (biomed/ nutri)	1	1,6	36.395	100	idem	100
12 (clinical/ nutri)	1	1,6	28.818	100	idem	100
19 (pub health/ pol, systems and serv)	1	1,6	6.876	100	idem	100
20 (biomed/tech dev)	3	4,8	56.230	100	idem	100
Total	62	100	1:571.287			

Source: Developed by author

Note: * Basic science projects were not able to distribute among research methodology.

Table 11. Research Projects Approved in 2006 by Category

			Type of research						TOTAL
			Biomedical		Clinical		Public health		
			No.	%	No.	%	No.	%	No.
			-	-	-	-	-	-	1
	Context	Socio-Economic-Cultural	-	-	-	-	3	4,8	3
	Problems	Communicable diseases	9	14,5	-	-	1	1,6	10
		Non-Communicable+Adictions	27	43,5	12	19,3	3	4,8	42
		Nutrition and Environment	1	1,6	1	1,6	-	-	2
OBJECTIVE		Violence and Accidents	-	-	-	-	-	-	0
	Actions	Health Policy, Systems and Services Research	-	-	-	-	1	1,6	1
		Research and technological development	3	4,8					3
		Traditional Medicine			-	-	-	-	0
		Basic Science*			-	-	-	-	1
		TOTAL	40	64,4	13	20,9	8	12,8	62

Source: Developed by the author

Note: * Basic science projects were not able to distribute among research methodology.

Table 12. Amounts Allocated to each Category in the year 2006

			Research Methodology			
			Biomedical	Clinical	Public Health	Total
			U$S PPP	U$S PPP	U$S PPP	U$S PPP
Objective	Context	Social, Economic and Cultural			58.283	58.283
	Problems	Communicable Diseases	164.256		22.289	186.545
		Non Communicable Diseases	745.617	321.498	94.757	1.161.872
		Nutrition and Environment	36.395	28.818		65.213
		Violence and Accidents				
	Actions	Health Policies, Systems and Services			6.876	6.876
		Technological R&D	56.230			56.230
		Traditional Medicine				
		Basic Science*				36.268
		Total	1.002.498	350.316	182.205	1.571.287

Source: Developed by the author.

Note: * Basic science projects were not able to distribute among research methodology.

7. Conclusions

The small number of observations (121 for a 5 years observation period) may underestimate health research participation, since the sample responds to the decisions made by funding agencies to whom information was requested on human health research projects.[68] Projects identified as basic research and therefore not included in this paper may have a health application in the medium or long time. Another reason for underestimation is that there is research not funded by competitive funds, but from regular activities of the Ministry of Health services, particularly the Epidemiology Division and the Public Health Laboratory that have not been included either.

Even with the previous considerations, this paper shows that health research is scarce, and so is national funding devoted to it, particularly when the importance of the health sector in the national GDP is considered.

Average amounts available per project are small in comparison with the international context and the funds that the same teams get from international sources, which have not been considered in this work. Other research has shown that the number of research teams that usually have access to international research funds is limited[69] and concentrated in some biomedical disciplines. Therefore, these teams may have continuity in the development of research lines and the training of new generations of researchers, which makes them more competitive at the national level too.

The predominance of biomedical research with emphasis in chronic non communicable diseases corresponds both to the reality of the academic sector and to the country's demo-epidemiological situation. This project has covered a limited time span, so that it is not possible to derive consequences on the evolution of health research funding during the XXth century, as the demo-epidemiological transition took place.

The scarce funding of public health research (18% of all projects) during the period is surprising in the context of the preparations for the health sector reform that became

[68] When this study was finishing, SECYT identified three projects funded by PDT, which were not included in the analysis but do not modify the relationship among categories nor the conclusions.

[69] Sánchez, Delia. Informe final de consultoría. Programa de Desarrollo Tecnológico. Informe Área de Oportunidad Salud. Montevideo, 2006

effective in 2007. This situation is multicausal, since it shows a deficit in both supply and demand. Furthermore, unlike biomedical researchers, full-time commitment to academic activities is the exception in this field.

In this context, the University of the Republic has played a key role in keeping health research alive, while funding agencies depending from the National State have had a limited presence, except the call for projects made by PDT in the year 2006. This seems to correspond to a perception of health research as “non strategic”, which in turn agrees with the absence of the Ministry of Health from the newly created Innovation Ministerial Cabinet.

The lack of research investment by the national pharmaceutical industry probably contributes to this situation, since no academy-industry partnerships are fostered in this area, and pressure is not made for the allocation of larger funds to it.

The increase in funding allocated to health research in 2006 is auspicious in case it shows the beginning of a trend and not an isolated phenomenon.

The presence of women amongst researchers is noteworthy, but not surprising since they are over half of all University students in the country. Furthermore, income levels of Uruguayan researchers are low in comparison with other options available to people with similar education level, though the activity has much social prestige. This dual condition of greater educational level and lower income than men coincides with existing information on the situation of women in Uruguay[70]

[70] Instituto Nacional de las Mujeres. MIDES Informe país. Convención CEDAW. Available on line in http://www.mides.gub.uy/inamu/informe_cedaw.pdf

The Public Financing of Research in Health: A Comparative Study of Latin American Cases

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1. Introduction

The objective of previous chapters was to present a theoretical and methodological framework for the study of publicly financed research in the area of health in five Latin American countries. In each chapter, we sought to establish common criteria to explain how countries allocate resources while preserving each country's distinguishing features. Each chapter provided separate timelines, as well as a description of the methodological and thematic priorities in publicly funded health research.

The objective of this last chapter is to put forward a comparative study of the financing mechanisms in health research, informed by the results of the country analyses, while discussing the priorities of the region.

In the next section, we provide a brief discussion about the institutional criteria that characterize the allocation of resources in the region as well as a description of the institutions charged with this responsibility. We then describe the social-sanitary profile of each country, which allow us to identify their theoretical research priorities.

In the fourth section, we will provide a comparative summary of the previous chapters, analyzing research projects in the health area that received public financing from the national government; the amount of financing in health research in each country; and their evolution during the five-year period from 2002 through 2006. Thereafter, we will identify the type of research methodologies receiving public resources, as well as the effect of this funding in the dissemination of knowledge, as reflected by the number of publications recorded in international databases.

We conclude discussing the criteria guiding the mechanisms to grant priority status to funding and, later contrasting said mechanisms with the actual allocation of funding in the five countries examined in this study.

2. Institutional framework

2.1. Mechanisms to allocate resources

Along previous chapters, it was highlighted the lack of homogenous criteria to describe how public resources in health research in Latin America are directed. In Argentina and Chile, most funding is allocated through research grants, fellowships, and/or the selection and continued financing of individual researchers with institutionally defined career paths.

In contrast, Bolivia lacks an institution charged with the responsibility to evaluate and select among competing research projects. Consequently, the discretionary exercise of such

prerogatives falls on the Ministry of Health and Sports. Intermediate cases include Uruguay - and more recently Paraguay- which are moving forward to implement systematic mechanisms for the competitive allocation of research funds.

In Paraguay and Uruguay, public universities finance and host most research projects In first case, more than 80% of the research in clinical and public health issues is developed by the public university (Universidad Nacional de Asunción), while in Uruguay, 62% of research on health is pursue through the Scientific Research Sectoral Commission that belongs to the National University (Universidad de la República)

In Argentina and Chile public universities receive research funds but they are not their main source of income. In the case of Chile, although CONICYT (National Commission for Scientific and Technological Research) is the institution that finances all the projects on health research, FONDECYT (National Fund for Scientific and Technological Development) awarded the maximum of resources during the period under study (85% of the projects). In Argentina most research projects until 2005 were funded by CONICET (National Council for Scientific and Technical Research) and for the last year FONCyT (Scientific and Technological Research Fund) was the main source of funds. In terms of number of annual projects, CONICET still concentrates during the period the highest participation with 70,93%, followed by Salud Investiga, with 14,34%, and Foncyt with 11,3%.

The criteria for the allocation and use of research funds determines a country's capacity to create a national system of innovation organized into networks, where public financing is shared among private and public institutions. Lower levels of development, in turn, are associated with wider discretion by the Ministry of Health, which is guided by strategic or emerging health guidelines.

This project seeks to bring to light differences in the mechanisms for allocating resources as well as the ways in which research funds help or hinder the coordination of a national system of innovation.

Through the comparative study of the five cases, it is possible to observe that the absence of a systematic norm to allocate resources results in the concentration of financing mechanisms in the public sector –as in Bolivia-, in all likelihood overestimating the capacity that the public sector has to finance a national health system.

In Argentina and Chile, it is likely that the resources allocated by the Ministry of Health were underestimated, because of the focus on systematic and formal mechanisms used to competitively assign grants. Moreover, the complexity of these countries' Health Ministries makes it more difficult to analyze the resource allocation process. Within these ministries, there are departments specialized in research and departments with research as a component of other more general activities. In the case of the latter, it is difficult to discriminate the sources of funding directed towards research from those of health spending.

Moreover in Argentina, decentralizing the health system resulted in each province's health ministry using local resources to finance health benefits, reducing the amount available for research. These resources were not considered in this study, relatively undervaluing the role of Health Ministries in the financing of health research in countries such as Argentina, Chile and, to a lesser extent, Paraguay and Uruguay, as they compare to Bolivia.

2.2. Financing institutions

Among the cases with publicly financed research in health, Bolivia stands out because of its highly centralized nature, with all research sponsoring activities controlled by the Ministry of

Health and Sports, and all government and superior education centers coordinated by the Vice-Minister of Science and Technology.

Paraguay Scientific Innovation System is made up of two major institutions: first, the National Counsel for Science and Technology (CONACYT), an autonomous public agency responsible for coordinating all research in science and technology. Its main function is to head and coordinate the *National System of Science, Technology, Innovation and Quality*, and to promote scientific and technological development in the country. The second institution is the network of universities, an essential part of the Paraguayan model of research and development.

In Uruguay, health research projects are financed by a number of research institutions, such as Universidad de la República, Instituto de Investigaciones Biológicas Clemente Estable – IIBCE (Clemente Estable Institute of Biological Research) and several private research centers in the area of social science. In particular, the promotion and financing of health research is spearheaded by the Agencia Nacional de Investigación e Innovación – ANII (National Research and Innovation Agency), the Dirección de Innovación, Ciencia y Tecnología para el Desarrollo – DICYT (Board of Innovation, Science and Technology for Development), the Consejo Nacional de Investigación, Ciencia y Tecnología – CONICYT (National Council for Research, Science and Technology) and the Comisión Sectorial de Investigación Científica de la Universidad de la República – CSIC (Commission of Scientific Research Sector of the University of the Republic). The institutional instruments to finance health research include the Fondo Nacional de Investigadores (National Fund of Researchers), Clemente Estable Fund, the Program for Technological Development, and the awardable funds from the sector's Commission.

In Chile, publicly financed health research is mainly funded through the autonomous Comisión Nacional de Investigación Científica y Tecnológica - CONICYT (National Commission for Scientific and Technological Research). Under its umbrella, several independent funds co-exist. There are no explicit coordination across funds nor prioritization of any type (across scientific disciplines or within them), except for a number of ad-hoc funds. One of them is the Fondo Nacional de Investigación en Salud – FONIS (National Fund for Health Research), created with a strong emphasis on public health research (though with a small amount of resources). In the case of Chile, it seems that adopting a formal mechanism to prioritize health research has been tacitly avoided.

To conclude, Argentina's national strategy for the promotion of research in health includes a broad set of institutions. First and foremost, the Consejo Nacional de Investigaciones Científicas y Técnicas – CONICET (National Council for Scientific and Technical Research), which is the most important research agency in the country and competitively distributes research grants in all scientific fields, including the sub-field of medicine and the Social Sciences. This agency also finances individual researchers whose are defined by seniority and experience standards.

Secondly, the Ministry of Science and Technology through the National Agency of Promotion of Science and Technology, administers two agencies that finance scientific research activities, including health research. The first of them, the Fondo para la Investigación Científica y Tecnológica – FONCyT (Fund for the Scientific and Technological Research), supports research projects and activities that promote new scientific and technological knowledge developed by researchers belonging to Argentina's public and private non-profit institutions. The second, the Fondo Tecnológico Argentino – FONTAR (Argentine Technological Fund), finances technological projects that improve productivity in the private sector through technological innovation. Since 2002, the Argentine Health Ministry houses the National Committee for Health, Science and Technology, which awards Social Science fellowships to new researchers. A similar strategy is sponsored by the Administración

Nacional de Laboratorios e Institutos de Salud –ANLIS (National Administration of Laboratories and Health Institutes), also within the Health Ministry, charged with the responsibility of administering eleven programs in health research and health services.

3. Demographic, Socio-Economic and Epidemiological Profiles

The allocation of resources to finance research in health is, arguably, ensured by a decision-making process linked to the medical needs of the population. Consequently, in this section we summarize some of the usual health indicators for each country, to describe the differences in the socio-sanitary profiles of the five nations.

The analysis in this section explains the main demographic, social and economic indicators as well as sanitary indicators of morbidity-mortality in the five countries. We analyze in further detail the years of potential life lost (YPLL) and described the usual indicators of morbidity-mortality.

3.1. Selected Indicators for the five countries

Table 1. Demographic and socio-economic indicators

	Demographic and socioeconomic	Argentina	Bolivia	Chile	Paraguay	Uruguay
1	Population (millions) (2007)	40	10	17	6	3
2	Urban Population (% of total pop.) (2005)	90,1	64,2	87,6	58,5	92,0
3	Human Development Index (HDI) / Country Position (2006)	0,860 (46)	0,723 (111)	0,874 (40)	0,752 (98)	0,859 (47)
4	Population living under the poverty line (% living on < 1,25 u$s per day) (2000-2006)	4,5	19,6	<2,0	9,3	<2,0
5	Adult literacy rate (% ages 15 and above) (2006)	97,6	89,8	96,40	93,6	97,8
6	Access to improved drinking water sources (%) (2006)	96	86	95	77	100
7	Gross National Income (GNI) PPP $ billions (2007)	513,0	39,4	209,0	26,8	36,6
8	Gross National Income (GNI) PPP $ per capita (2007)	12,990	4,140	12,590	4,380	11,040
	Health expenditures					
9	Per capita Government Expenditure on Health in Dollars (PPP) (2006)	1665	204	697,00	342	989

Sources/Notes:

World Bank, World Development Report 2009 (1, 2, 7, 8)

United Nations, United Nations Development Indices 2008. (3, 4, 5, 6)

World Health Organization, World Health Statistics 2009 (9)

Considering all the countries included in this study, Argentina is the most populated (40 millions), doubling the population of Chile (17 millions), which ranks second in number of inhabitants, followed by Bolivia (10 millions). In the opposite side, Uruguay has only 3 million inhabitants and that represents half of Paraguay's population.

In addition, there are big differences in percentage of urban population among the countries. While Uruguay, Argentina and Chile have high proportion of urban population (almost 90%) Bolivia and Paraguay are countries that still have a high percentage of rural population, 35,8% and 41,5%, respectively.

For the year 2007, Argentina has a Gross National Income (GNI) of 513 billions of dollars (PPP), followed by Chile (209). The GNI of the rest of the countries is well below: Bolivia (39,4), Uruguay (36,6) and Paraguay (26.8). Adjusting GNI per capita, two groups of countries are clearly defined. The first of them includes Argentina, Chile and Uruguay, with a GNI per capita around 12,000, which triplicates the sum of the other one, with Bolivia and Paraguay, which are around 4,000.

An alternative measure to go beyond the GNI is the Human Development Index (HDI), which is a summary measure of a country's average achievement in three components: life

expectancy, educational achievement and Gross Domestic Product (GDP) per capita (United Nations Development Programme, 2008). In this sense, Chile, Argentina and Uruguay are countries with a high human development (0,800 or above), and they rank 40, 46 and 47 among all the countries included in the HDI, respectively. On the other hand, Paraguay and Bolivia rank 98 and 111, respectively. The last two countries have a HDI near 0,700, which represents a medium human development[71].

According to the World Health Organization, in regard to health care expenditures, the average per capita expenditure on health of the five countries is 779 dollars (PPP) for the same year. Argentina has the highest expenditure (1,665) while Bolivia has the lowest one (204).

3.2. Main causes of death

Table 2 below shows the 2004 distribution of Years of Potential Life Lost for each country, by three broader causes: communicable diseases, non-communicable diseases and accidents. Although differences in the total population by country affect the YPLL count, the relative importance of each category as a percent of total cases allows us to draw country specific conclusions.

Table 2. Distribution of Years of Life Lost by Broader Causes in the five countries (%) (2004)[72]

Causes	Argentina	Bolivia	Chile	Paraguay	Uruguay
Communicable diseases	18%	54%	10%	33%	12%
Non-communicable diseases	67%	34%	71%	44%	74%
Accidents	15%	11%	19%	23%	15%
Total	100%	100%	100%	100%	100%

Source: World Health Organization, World Health Statistics 2009.

Excepting Bolivia, non-communicable diseases are the main source of morbidity-mortality in the countries. However, there are noticeable differences. In the case of Argentina, Chile and Uruguay, the percentage of non-communicable illnesses exceeds 67%, with 67%, 71% and 74%, respectively. By contrast, Bolivia displays more years of life lost by communicable than on non-communicable illnesses (54% and 34%, respectively), placing this country in a different epidemiologic stage. Paraguay is in an intermediate stage, with a 44% for non-communicable illnesses while the incidence of communicable illnesses (33%) remains significant.

In the case of accident-related YPLL values, the average of the five countries represents more than a 16%, with a maximum of 23% in Paraguay and a minimum of 11% in Bolivia.

3.3. Morbidity-mortality

Complementary to the previous analysis, Table 3 shows four indicators commonly used to evaluate health status: life expectancy at birth, infant mortality index, infant mortality index for children up to 5 years old (both indexes for each 1,000 live births), and maternal mortality index (for each 100,000 live births) by country in 2007 (WHO, 2009).

As can be observed in the table, Chile is the nation with the best health indicators, with a life expectancy of 78 years of age and a maternal mortality index of 16 per 1000. By contrast, life

[71] Medium Human Development: when HDI is between 0,500 and 0,799.
[72] Last data available from the World Health Organization corresponds to year 2004..

expectancy is 75 of age and the mortality index is 77 for Argentina, 75 and 20 for Uruguay, 74 and 150 for Paraguay and 66 and 290 for Bolivia.

Also, in terms of infant mortality, Chile is the leader in the group with only 8 deaths each 1,000 live births, whereas Paraguay and Bolivia have values of 24 and 48 for each 1,000, respectively.

Table 3. Morbid-Mortality Indicators.

Indicators	Argentina	Bolivia	Chile	Paraguay	Uruguay
Life Expectancy at Birth (years) (2007)	75	66	78	74	75
Infant Mortality Rate (per 1000 live births) (2007)	14	48	8	24	12
Mortality Rate < 5 years (per 1000 live births)	16	57	9	29	14
Maternal mortality ratio per 1000 live births (2005)	77	290	16	150	20

Source: World Health Organization, World Health Statistics 2009.

4. Comparative analysis of the financing of public research in health

In this section, we analyze the behavior of resources invested by each country in the 2002-2006 period to create knowledge in the area of health. To this end, we seek to explain performance as the function of the size of the population, the country, and the choice of research methodologies.

Table 4 presents the total number of approved research projects and total budget by country in 2006. Also, with the object of adjusting the relative values by the country's population, we provide relative values for each ten thousand inhabitants.

Table 4. Quantity and amount of projects for each 10,000 inhabitants. 2006

Country	Total Projects	Projects per 10000 inhabitants	U$S PPP	U$S PPP per 10000 inhabitants
Argentina	1457	0.37	55.424.294,80	14.221,93
Bolivia	23	0.02	1.557.979,74	1.618,34
Chile	344	0.20	26.269.001,30	15.982,60
Paraguay	42	0.06	492150	819,02
Uruguay	62	0.18	1.571.287	4.727,10

Source: Developed by the authors basing on data given by the Project team.

As expected, Argentina is the country with the largest number of research projects (1457), followed by Chile (344), Uruguay (62), Paraguay (42), and, lastly, Bolivia (23). The rank ordering also remains the same when adjusting by population, with Argentina scoring a maximum of 0.37 research projects per 10,000 inhabitants and Bolivia a minimum of 0.02.

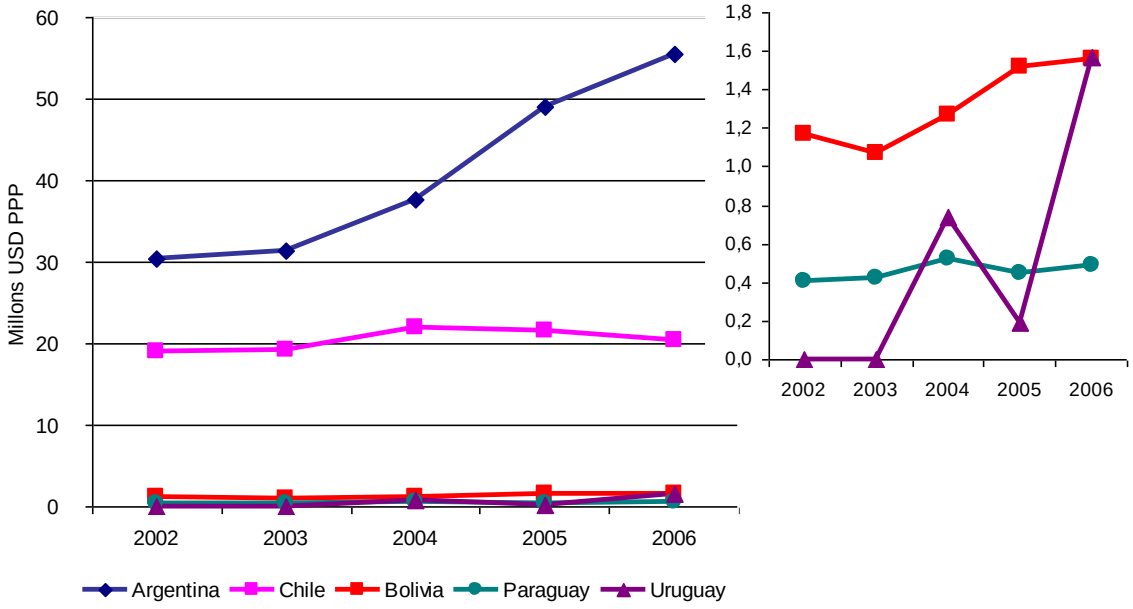
However, the total amounts (in PPP U$S Dollars) provide a complementary interpretation. Argentina is still ranked highest (with more than 55 million dollars), followed by Chile (with 26 million dollars). Uruguay (whose amount exceeds 1.5 million dollars) and Bolivia share about the same amount of public funding devoted to health research (1,5 million USD PPP), leaving in the fifth place Paraguay, with half a million dollars PPP for the analyzed period.. On the other hand, in per capita basis, Chile is ranked highest with more than 15 thousands dollars per every 10,000 inhabitants, followed by Argentina, with 14 thousands.

The previous analysis describes the behavior of research funds statically. Figure 1 presents a time series with the evolution of these variables in the 2002-2006 period and by country, in millions of dollars (PPP).

The Argentine and Chilean series display the largest amounts of public financing in health research during this period. In the first case, Argentina, financing for research projects increased from approximately 30 million dollars in 2002 to more than 55 million in 2006.

A different series is described for Chile, with financing for research projects increasing until 2005 (with values near 28 million), and decreasing thereafter to 26 million. While in Argentina the annual growth rate in publicly financed research was approximately 16%, the average annual increase in Chile was a more modest 6%.

Figure 1. Temporal evolution of total financing. Millions of US$ PPP. 2002-2006



Source: Developed by the authors basing on data given by the Project team.

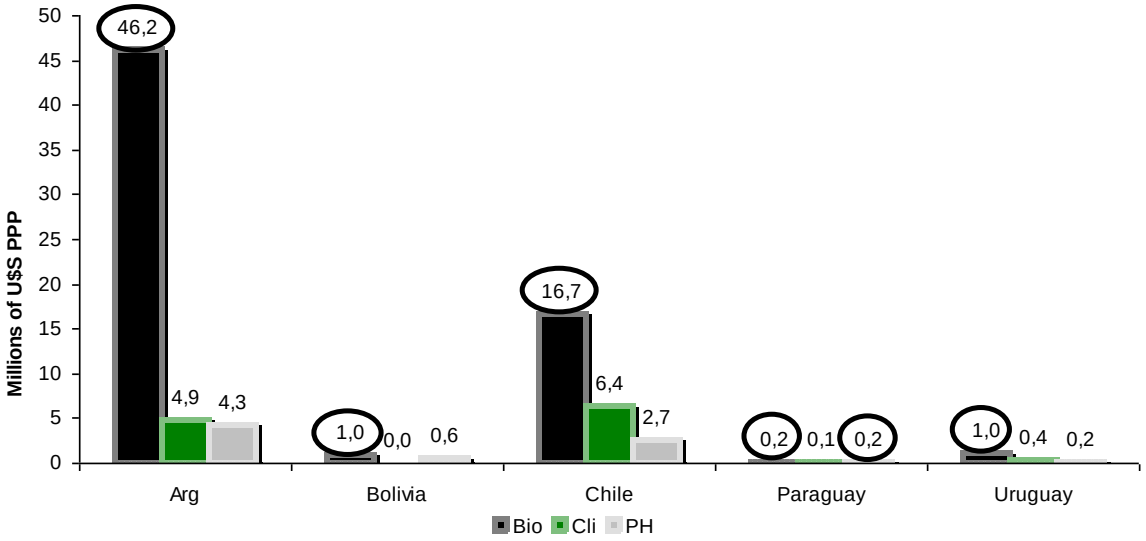
Similarly, while financing in Paraguay remained relatively constant under half a million a year, Bolivia increased its investment in health research from 1,2 million in 2002 to almost 1,6 in 2006. That is, the growth rate of financing in Bolivia and Paraguay approximately averaged 8% and 6% respectively. In contrast, investment in Uruguay decreased during the period 2004-2005 and strongly increased in 2006.

4.1. Amounts and participation by research methodology

The previous section described the cross-sectional and time-series of publicly financed investment in health research for each country. In a complementary way, due to important differences in the allocation for different issues and objectives stated in each research project, it is necessary to analyze the composition of these research funds.

To this end, we present below (Figure 2) the amounts (expressed in millions of PPP dollars) that each country allocated to research projects related to the methodologies considered in this study -biomedicine, clinical research, and public health- in 2006.

Figure 2. Financing by research methodology. 2006 (in millions of dollars PPP)



Source: Developed by the authors basing on data given by the Project team.

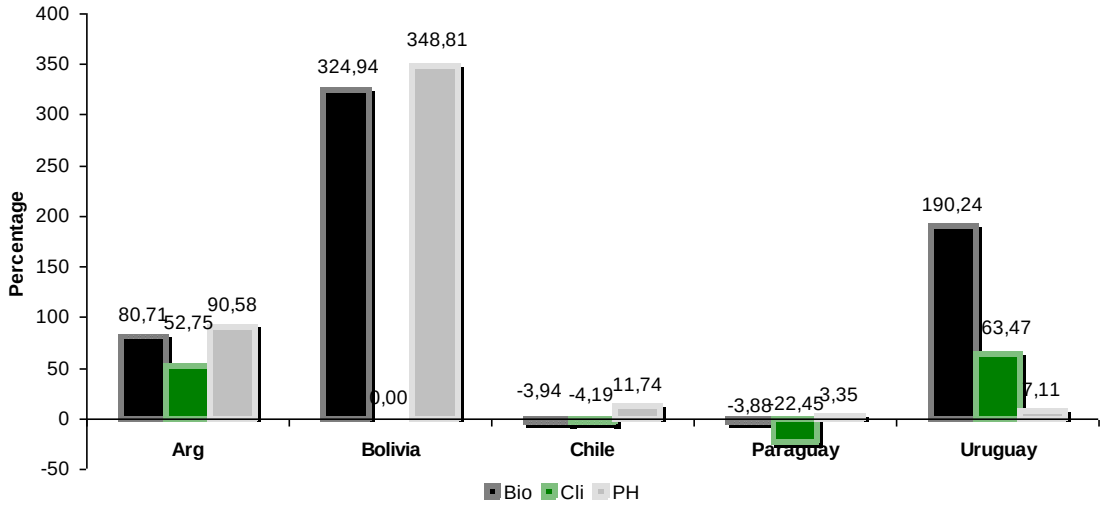
From Figure 2 above it is possible to note that biomedicine was the research field that received the most financing in every country in 2006. However, important differences remain in the total amount of resources invested by each country. In particular, while Argentina allocated a little more than 46 million dollars to biomedicine, Chile invested slightly less than 17 million.

By contrast, Paraguay and Uruguay invested around half a million each. Meanwhile, Bolivia allocated no resources to financing projects in the field of clinical research, yet invested 1 million in biomedical projects.

Chile -with approximately 7 million dollars- was the leader in clinical research investment, followed by Argentina (3 million), Uruguay (400,000) and Paraguay (100,000).

Finally, observing the performance of the analyzed resources over time, Figure 3 shows the percent variation of publicly financed funds for the 2004-2006 period, by country and type of research methodology.

Figure 3. Variation percentage of financing by research methodology. 2004-2006



Source: Developed by the authors basing on data given by the Project team.

Bolivia and Uruguay are the two countries that display the highest variance. In the former, financing increased over 3%, both for research projects in biomedicine and in subjects related to public health. Meanwhile, Uruguay shows a slight increase in all three fields, with an increase of almost 2% in biomedicine, 0.63% in clinical research, and 0.07% in public health research. Argentina shows a small increase in clinical and public health methodologies (0.02% and 0.23%, respectively) and a slight decrease in biomedical studies, (0.09%). In the case of Chile and Paraguay, it becomes evident that their only increase was public health (with 0.16% and 0.03%, respectively).

5. Publications

In this section we analyze the diffusion of innovation in health research, through a research study published by researchers from all five countries. We focus on two datasets generally used to report data on total publications per 10,000 inhabitants between 2002 and 2007 (see Tables 5 and 6).

Table 5. Temporal evolution of the percentage of publications for each 10,000 inhabitant Lilacs Database

Country	Lilacs Database					
	Publications per 10000 inhabitants					
	2002	2003	2004	2005	2006	2007
Argentina	0,43	0,44	0,50	0,45	0,40	0,20
Bolivia	0,68	0,46	0,30	0,08	0,00	0,05
Chile	1,15	1,08	1,15	0,99	1,03	0,69
Paraguay	0,24	0,18	0,11	0,10	0,03	0,00
Uruguay	0,30	0,54	0,38	0,51	0,37	0,21

Source: Developed by the authors basing on data given by the Project team.

Table 6. Temporal evolution of the percentage of publications for each 10,000 inhabitant. Scielo Database

Country	Scielo Database					
	Publications per 10000 inhabitants					
	2002	2003	2004	2005	2006	2007
Argentina	0,09	0,15	0,21	0,28	0,30	0,18
Bolivia	0,02	0,02	0,01	0,02	0,02	0,02
Chile	0,70	0,74	0,79	0,84	0,99	0,91
Paraguay	0,00	0,01	0,01	0,01	0,01	0,01
Uruguay	0,13	0,12	0,14	0,24	0,29	0,23

Source: Developed by the authors basing on data given by the Project team.

As reported in Table 5, data from Lilacs publications shows that Chile ranked first in total publications per 10,000 people, with a maximum value of 1.15 and a minimum of 0.69. In the Scielo database results reported in Table 6, Chile again ranked first with a maximum of almost 1 one publication per 10,000 people in 2006. Taken together, the years 2002 and 2005 show the greatest total number of publications per 10,000 people (2.8 and 0.94 respectively) if all countries were considered together.

These bibliometric indicators however, critically depend on the reference database used. Chile joined SCIELO before Argentina and had more national journals indexed. This fact produces a relative underestimation of Argentina's production. In addition, SCIELO and LILACS are database which journals join voluntarily. Therefore, they are not necessarily

representative of Latin American journals. In addition, adjusting bibliometric indicators by population needs to consider that small countries tend to have larger per capita rates.

In any case, the results highlight very low levels of dissemination of scientific knowledge by all five countries in the last six years.

6. Mechanisms for setting priorities

The definition of a methodology to help outline a structure for setting priorities -in health policies and programs in general as well as research funding in particular- is an area constantly being debated, due to its complexity and the numerous possible approaches to addressing it.

From comparative cost-benefit studies to the analysis of social-sanitary profiles, there is little consensus on how to settle on clear, common rules for the allocation of resources in the general area of public health, particularly in health research.

In the first place, and **according to the social, economic and epidemiological profile of the countries**, through the analysis of the YPLLs tables presented in the third section of this chapter, for example, it is possible to consider that country specific illnesses should weigh more heavily on the funding priorities of each nation. Consequently, the fact that over 65% of YPLLs in Argentina, Chile and Uruguay are attributed to non-communicable illnesses should lead to investment policies more heavily concentrated in such fields. Similarly, Bolivia and Paraguay should probably allocate a larger share of their resources to research projects in the subjects that relate to communicable illnesses.

However, using the same information, it is understandable that a rational use of scarce **resources should result in the financing of research lines to eliminate inequities** in the access to services, facilitating a greater homogeneity in the country's sanitary profile. From this perspective, a second funding strategy would find that research topic related to communicable diseases should receive a more than proportional funding from Argentina, Chile and Uruguay, in order to reduce the equity gap, assuring the epidemiological transition.

Additionally, there are other mechanisms for setting research priorities that are not necessarily linked to social-sanitary profile indicators. One example could come from the need to **improve the use of existing resources in the provision of health** which would lead to public health and social research being prioritized in detriment of clinical and biomedical research. This would help improve mechanisms for assuring health coverage and managing existing resources, especially in countries with strong institutional barriers related to segmented systems.

Furthermore, prioritization of research topics might be related to certain issues whose research may be considered **strategic in the future**, even if their social, economic and sanitary profile or the health system's current needs do not merit it.

Any of the aforementioned criteria –in addition to others that we may add- show that the mechanisms for setting priorities are complex and that it is not a simple task to compare how sums were allocated in each of these countries. **These modes were shaped not only by technical aspects, but also by political decision-making.**

Table 7. Categories Priorization and Relative Participation on Allocated Resources. 2006

Objectives	Research Methodology																	
	Biomedical						Clinical						Public Health					
	Total U$S PPP	Argentina %	Bolivia %	Chile %	Paraguay %	Uruguay %	Total U$S PPP	Argentina %	Bolivia %	Chile %	Paraguay %	Uruguay %	Total U$S PPP	Argentina %	Bolivia %	Chile %	Paraguay %	Uruguay %
Social, Economic and Cultural	47.674,20	0,00%	100,00%	0,00%	0,00%	0,00%	124.020,00	100,00%	0,00%	0,00%	0,00%	0,00%	325.200,94	52,40%	2,92%	26,75%	0,00%	17,92%
Communicable Illnesses	9.015.558,59	61,72%	6,73%	28,56%	1,16%	1,82%	2.206.432,66	41,95%	0,00%	56,11%	1,94%	0,00%	1.091.902,30	12,68%	19,32%	55,68%	10,28%	2,04%
Non-Communicable Illnesses	24.483.598,90	72,48%	0,00%	24,36%	0,12%	3,05%	5.912.092,56	36,17%	0,00%	57,41%	0,98%	5,44%	826.966,27	29,34%	1,15%	50,91%	7,15%	11,46%
Nutrition and Environment	1.794.038,98	16,51%	19,14%	62,32%	0,00%	2,03%	1.485.360,40	21,31%	0,00%	76,75%	0,00%	1,94%	1.591.877,04	44,32%	4,70%	50,51%	0,47%	0,00%
Violence and Accidents	17.000,00	100,00%	0,00%	0,00%	0,00%	0,00%	76.000,10	44,74%	0,00%	55,26%	0,00%	0,00%	24.503,64	61,22%	38,78%	0,00%	0,00%	0,00%
Health Policies, Systems and Services Research	0,00	0,00%	0,00%	0,00%	0,00%	0,00%	367.802,00	100,00%	0,00%	0,00%	0,00%	0,00%	3.033.610,90	65,24%	8,10%	25,12%	1,32%	0,23%
Technological R&D	4.968.394,53	67,31%	0,00%	30,96%	0,61%	1,13%	1.476.638,48	67,66%	0,00%	31,83%	0,51%	0,00%	1.072.603,45	100,00%	0,00%	0,00%	0,00%	0,00%
Traditional Medicine	231.412,00	100,00%	0,00%	0,00%	0,00%	0,00%	0,00	0,00%	0,00%	0,00%	0,00%	0,00%	0,00	0,00%	0,00%	0,00%	0,00%	0,00%
Basic Science	24.490.570,70	77,43%	0,00%	22,49%	0,00%	0,07%	113.286,40	27,50%	0,00%	56,49%	0,00%	16,01%	1.980,00	100,00%	0,00%	0,00%	0,00%	0,00%

Source: Developed by the authors based on data originated in the Project

Based on this information, Table 7 illustrates the relative participation in 2006 of all five countries in terms of total percentage of funds for each objective and according to the matrix of methodologies and research issues used in the study.

The selected cells reflect the country with the maximum relative percentage in each category. According to this, and first considering research programs based on biomedical methodology, Argentina has the greatest share in six out of nine categories, with percentages higher than sixty percent in each of them. Only social, economic and cultural objectives, has Bolivia with the highest share, while Chile takes the lead in projects based on Biomedical methodologies and focused on nutrition and the environment (100% and 62,32%, respectively).

These models change radically when considering projects associated to clinical methodology. In this case, Argentina leads in research on objectives in social policy, systems and services, in social, economic and cultural issues as well as technological R&D. Chile presents maximum values in all other five financed objective categories, with its highest percentage in nutrition and the environment (76.75%).

In the case of studies in public health methodology, Argentina leads in social, economic and cultural objectives, research on health policy, systems and services, violence and accidents, technological research and development, and basic science (52,40%, 61,22%, 65,24% in each one of the first three categories, and 100% of the last two).. Finally, Chile has the greatest values in studies in both communicable and non-communicable illnesses, and nutrition and the environment, with shares of 55,61%, 59,91% and 50,51%, respectively).

Table 7 also shows how focused are public health research in Paraguay and Uruguay in topics related to their main sources of illnesses. Even with small participation in the group, Paraguay concentrates its funding on communicable diseases, for each methodological group (biomedical, clinical and public health). Uruguay, on the other side, devoted its resources towards research in communicable diseases mainly, for each methodological approach, with nutrition and environment as the second research group. Bolivia organizes its research agenda giving priority to nutrition and environment as well as socio, economic and cultural issues related to biomedical research, also investing in communicable diseases and violence and accidents when public health projects.

While the five countries show similar percentages in YPLL related to violence, their shares vary widely. Argentina finances the total number of projects related to the objective of violence and accidents connected to biomedical methodologies and is responsible for 44.74% and 61,22% of clinical research and public health in that category, although these are low figures for a national investment in public health research. Correspondingly, Chile supports 55.26% of clinical studies with no investments in public health interventions, while Bolivia is responsible 38,78% of those related to methodologies in public health.

Comparing all five countries together for 2006, Table 8 shows that non-communicable diseases takes about 50,27% of the group investments on clinical research, followed by 18,76% for communicable diseases and 12,55% related to Technological R&D. At the same time research projects based on biomedical methodologies with a focus on non-communicable illnesses and basic sciences receive priority financing at 37,65% each. Finally, the area with the greatest diversification of funds is that of research projects associated with public health methodologies. Research in social services, policies and systems is responsible for 38% of the resources assigned to the area, while nutrition and the environment participates with 20% of the group and categories of communicable illnesses, and technological R&D receives about 13,70% and 13,46%, respectively.

Table 8. Objectives Participation on Total Funds. 2006 (%)

Objectives	Research Methodology		
	Biomedical	Clinical	Public Health
Social, Economic and Cultural	0,07%	1,05%	4,08%
Communicable Illnesses	13,86%	18,76%	13,70%
Non-Communicable Illnesses	37,64%	50,27%	10,38%
Nutrition and Environment	2,76%	12,63%	19,98%
Violence and Accidents	0,03%	0,65%	0,31%
Health Policies, Systems and Services Research	0,00%	3,13%	38,07%
Technological R&D	7,64%	12,55%	13,46%
Traditional Medicine	0,36%	0,00%	0,00%
Basic Science	37,65%	0,96%	0,02%
	100,00%	**100,00%**	**100,00%**

Source: Developed by the authors based on data originated in the Project

Table 9 summarizes total funding dedication across research methodologies and objectives. Non communicable diseases represents 36,83% of the regional priorities, specially in biomedical research, which receives 28,88% of the resources. Basic sciences is the second source of public expenditures, with about 29,02% and communicable diseases, specially biomedical research, is located in third place, with 14,52% total (10,63% biomedical). Clinical research represents, altogether, 13,87% of public funding, where projects on non-communicable diseases receives half the budget. At the same time, public health interventions participate with 9,4% of total research.

Table 9. Research Methodology Participation on Total Funds, 2006 (%)

Objectives	Research Methodology			
	Biomedical	Clinical	Public Health	TOTAL
Social, Economic and Cultural	0,06%	0,15%	0,38%	**0,59%**
Communicable Illnesses	10,63%	2,60%	1,29%	**14,52%**
Non-Communicable Illnesses	**28,88%**	6,97%	0,98%	**36,83%**
Nutrition and Environment	2,12%	1,75%	1,88%	**5,75%**
Violence and Accidents	0,02%	0,09%	0,03%	**0,14%**
Health Policies, Systems and Services Research	0,00%	0,43%	3,58%	**4,01%**
Technological R&D	5,86%	1,74%	1,27%	**8,87%**
Traditional Medicine	0,27%	0,00%	0,00%	**0,27%**
Basic Science	**28,89%**	0,13%	0,00%	**29,02%**
TOTAL	**76,73%**	**13,87%**	**9,40%**	**100,00%**

Source: Developed by the authors based on data originated in the Project

Finally, although developing nations have strong incentives in looking for receiving basic and biomedical research as given, the regional evidences shows that clearly Argentina, and in less extent Chile, invest significant proportions of a growing R&D funding on health to these areas of knowledge. On the other hand, public health interventions result clearly in a situation of unsatisfied demands from the society. Even considering that these type of projects are relatively less expensive, they altogether do not reach ten percent of the total regional budget.

Finally, although developing nations have strong incentives in considering basic and biomedical research as given, receiving innovations once they where produced in develop countries desarrollados.

the regional evidences shows that clearly Argentina, and in less extent Chile, invest significant proportions of a growing R&D funding on health to these areas of knowledge. On the other hand, research devoted to public health interventions are clearly underrepresented, considering population's epidemiological profile and health care systems' need.
public health interventions result clearly in a situation of unsatisfied demands from the society. Even considering that these type of projects are relatively less expensive, they altogether do not reach ten percent of the total regional budget.

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