

## Incentives and challenges related to technological research and innovation within the Unified Health System in the Federal District of Brazil

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**Abstract** *This article analyzes the profile of research conducted in the Federal District of Brazil funded through public calls for proposals issued by the Research for the SUS Program: shared health management/Federal District (PPSUS/DF) and a research support program run by the Superior School of Health Sciences, maintained by the Health Sciences Teaching and Research Foundation (ESCS/FEPECS, acronym in Portuguese). A document analysis was undertaken of all research funded by the PPSUS/DF and ESCS/FEPECS's Research Support Program between 2008 and 2017 using the following variables: year, title, research themes of the National Agenda for Health Research Priorities (ANPPS, acronym in Portuguese), implementing organization, area of application of research, and amount of funding. PPSUS/DF funded 73 projects with a total investment of approximately R\$8 million, while ESCS/FEPECS funded 85 projects with a total investment of R\$2.3 million. This study provides a critical analysis of the research themes supported by ESCS/FEPECS and PPSUS/DF between 2008 and 2017. It is recommended that future calls for proposals should prioritize the three leading causes of death in the Federal District and the organization and evaluation of healthcare services.*

**Key words** *Scientific research and technological development, Unified health system, Health services research, Research funding*

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## Introduction

The effective use and incorporation of new knowledge and research evidence is essential for meeting current health challenges and informing decision-making and policy<sup>1</sup>. Despite the importance of research for the development of new interventions and technologies, administrators face the dilemma of allocating scarce resources to the adoption of technologies that provide solutions to health problems or funding research that could develop new treatments and diagnostic approaches, enhance healthcare services, and lead to social advances<sup>2</sup>.

Scientific and technology research and innovation are key elements in all sectors of society, particularly the health sector, where they can generate significant changes in work relations and processes<sup>1</sup>.

Decision-making regarding the use and incorporation of new knowledge and technologies should take into account service provision, the epidemiological and demographic characteristics of the population, and capacity to solve health problems. In a survey of the distribution of research groups across states conducted by the National Council for Scientific and Technological Development (CNPq, acronym in Portuguese) in 2016, the Federal District appeared in 12<sup>th</sup> place, with 867 research groups, behind states of the Southeast Region (São Paulo: 7,447; Rio de Janeiro: 4,360; and Minas Gerais: 3,477), South Region (Rio Grande do Sul: 3,601; Paraná: 3,174; and Santa Catarina: 1,862), Northeast Region (Bahia: 1,821; Pernambuco: 1,316; and Paraíba: 1,056), and North Region (Pará: 960)<sup>3</sup>. Research groups are one of the factors that influence local research capacity.

On the other hand, the Federal District had 149 doctoral graduates per 100,000 population in 2014, the highest proportion in the country, compared to the states of Rio Grande do Sul, Rio de Janeiro, and **São Paulo**, which had 109, 105, and 75, respectively<sup>4</sup>.

Law 6.140, which came into force on 03/05/2018, deals with incentives for scientific and technology research and innovation in the Federal District. Aimed at promoting wealth creation, Article 3 provides that “For the effective development and consolidation of research, technological development, and innovation policy, the following priority areas shall be considered: II - technological development: projects defined by research institutions, the business sector, and technology transfer contracts as hav-

ing great market potential or being in the public interest, whether incremental or radical innovation, which aim to develop proofs of concept, prototypes, and business models”. Moreover, according to Article 27, the Government of the Federal District shall stimulate research and the development of innovations through the provision of financial and human resources and infrastructure<sup>5</sup>.

The nationwide Research for the SUS Program: shared health management (PPSUS, acronym in Portuguese) is coordinated by the Ministry of Health’s Department of Science and Technology (Decit, acronym in Portuguese) in partnership with the CNPq and the respective state research foundations (FAP, acronym in Portuguese) and departments of health (SES, acronym in Portuguese). The primary objective is to promote scientific and technological development and innovation aimed at reducing regional imbalances in the field of science and technology, incorporating research outputs into health actions, programs, and services in order to contribute to the improvement of living conditions and health status<sup>6</sup>. One of the challenges of the PPSUS is to reduce the mismatch between scientific output and technology incorporation in the different regions of Brazil<sup>7</sup>.

In 2018, the Department of Health of the Federal District of Brazil (SES-DF) issued Departmental Order 425 (April 8, 2018) creating the innovation network *Rede InovaSES*. One of the network’s aims is to stimulate creative ideas and solutions to improve, redesign, and transform processes and services. The network consists of a web portal designed to facilitate knowledge management in innovation in digital and physical environments<sup>8</sup>.

The Federal District Research Foundation (*Fundação de Apoio à Pesquisa do Distrito Federal* - FAP/DF) funds research in alignment with the priority research areas defined by the PPSUS/DF. In 2017, R\$3 million were invested in health-related research, with studies in the area of health technology and innovation receiving the largest number of researches grants<sup>9</sup>.

A study published in 2017 that assessed the degree of implementation of the PPSUS across states revealed that the Federal District was among those states that used the smallest number of models for setting priorities. The use of these models was one of the criteria used to assess degree of implementation<sup>10</sup>.

The results showed that the Federal District used a maximum of three methodologies, while

the majority of the states used four or more<sup>10</sup>. In 2018, the Ministry of Health published a guide for setting health research priorities that encourages the use of models<sup>11</sup>. The adoption of a rational model for setting research priorities based on sound methods is essential to ensure that health research has the maximum possible impact on the maximum number of people<sup>12</sup>.

The aim of this study was to analyze the profile of research conducted in the Federal District funded through public calls for proposals issued by the PPSUS/DF and a research support program run by the Superior School of Health Sciences, maintained by the Health Sciences Teaching and Research Foundation (ESCS/FEPECS, acronym in Portuguese) between 2008 and 2017.

## Methods

A document analysis was undertaken of all research funded by the PPSUS/DF and ESCS/FEPECS's Research Support Program between 2008 and 2017. The study was conducted in three stages: i) Gathering of information published in the *Diário Oficial do Distrito Federal* (the official government gazette, hereafter referred to as DODF) regarding research projects approved by ESCS/FEPECS's Research Support Program; ii) Gathering of information from research projects funded by the PPSUS/DF available in the Decit's online public access management system *Pesquisa Saúde* (Research Health) (<http://pesquisasaude.saude.gov.br>); and iii) Compilation and analysis of the research data, categorized as follows for analysis purposes: year, title, research subagenda of the National Agenda for Health Research Priorities (ANPPS, acronym in Portuguese), implementing organization, area of application of research, and amount of funding.

ESCS/FEPECS's Research Support Program was established in 2008 (FEPECS N° 21/2008)<sup>13</sup>. Between 2008 and 2017, the program was an important source of funding for research within the SES-DF.

The aim of the program is to support research that contributes to the improvement of the Federal District's public health system (*Sistema Único de Saúde do Distrito Federal - SUS-DF*), health education, and quality of life and health status of the population. The program supports research in the following priority areas defined by FEPECS and the SES/DF<sup>13</sup> in partnership with the scientific community and health administrators: healthcare policy; management, ac-

cess, quality and funding; health economics and health technology; diseases and health problems; healthcare for specific population groups; health promotion; and the environment and health surveillance.

Data was obtained from the following calls for proposals (CFPs) issued by ESCS/FEPECS and published in the DODF: CFP N° 57 of 10/29/2008, published in DODF N° 219 of 11/4/2018; CFP N° 34 of 9/17/2009, published in DODF N° 185 of 9/24/2009; CFP N° 2 of 2/18/2010, published in DODF N° 35 of 2/22/2010; CFP N° 53 of 9/22/2010, published in DODF of 9/29/2010; CFP N° 12 of 3/14/2011, published in DODF of 4/1/2011; CFP N° 2 of 3/7/2012, published in DODF of 3/9/2012; CFP N° 18 of 5/2/2013, published in DODF of 5/15/2018; CFP N° 41 of 10/2/2013, published in DODF of 10/7/2013; CFP N° 11 of 9/3/2014, published in DODF N° 187; CFP N° 11 of 9/3/2014, published in DODF N° 187; CFP N° 36 of 9/14/2015, published in DODF of 9/16/2015; CFP N° 16 of 8/15/2016; CFP N° 26 of 7/26/2017.

PPSUS/DF is coordinated by the Decit, which is part of the Ministry of Health's Secretariat of Science, Technology, and Strategic Inputs (SC-TIE, acronym in Portuguese), in partnership with the CNPq at national level, and state research foundations and health departments at state level. CFPs are generally biannual and involve the following stages: definition of research priorities, project selection, and monitoring and evaluation seminars. Research priorities are defined in workshops held with health administrators, technical staff, and researchers. They must include problems whose solutions depend on scientific knowledge, such as health problems with high rates of morbidity and mortality, issues that pose an elevated cost burden for the SUS, problems that have potential for innovation, and other key concerns for the SUS.

Another important instrument used for defining research priorities is the ANPPS, which is composed of 24 subagendas: indigenous peoples' health; mental health; violence, accidents, and trauma; black population health; noncommunicable diseases; older persons' health; child and adolescent health; women's health; health of people with special needs; diet and nutrition; bioethics and research ethics; clinical research; health productive complex; technology assessment and health economics; epidemiology; demography and health; oral health; health promotion; communicable diseases; health communication and information; work management; health educa-

tion; health systems and policy; health, the environment, and work; and pharmaceutical care. As provided in the National Policy on Science, Technology and Innovation in Health<sup>14</sup>, the criteria used to define the areas of research that make up the subagendas were applicability and impact on the health of the population.

The selection process for proposals submitted to the call for proposals has three stages: analysis by ad hoc consultants from outside the Federal District; analysis by an evaluation commission made up of invited experts (researchers and technical staff from the SES); and evaluation and final judgment by the PPSUS Steering Committee, composed of representatives from the Decit, SCTIE, MS, CNPq, FAP, and SES.

Although the first edition of the PPSUS/DF was launched in 2004, the present study covers the calls for proposals issued between 2009 and 2017 for the purposes of comparison with ESCS/FEPECS.

## Results

Between 2009 and 2017, PPSUS/DF issued five CFPs and funded 73 projects with a total investment of approximately R\$8 million. Of this amount, 62% was provided by the MS and 38% by the FAP/DF, except in 2016 when the foundation provided 57% of the funding (Table 1).

The CFPs issued in 2014 and 2016 accounted for the largest proportion of total funding over the period, with 21% and 35%, respectively. The CFPs issued in 2010, 2014, and 2016 resulted in the largest number of research projects, with 21, 15, and 21, respectively, and ANPPS subagendas, with 12, eight, and nine, respectively.

ESCS/FEPECS issued 10 CFPs between 2008 and 2017, funding 85 projects with a total investment of R\$2.3 million, as shown in Table 2.

The funding provided by ESCS/FEPECS was allocated mainly to research in SES-DF hospital facilities conducted by researchers from the institution in association with postgraduate non-degree and degree programs (residency, Master's, and PhD) provided by the ESCS and other educational institutions. The research funded by PPSUS/DF, which has more resources, was conducted by a wider range of institutions, including universities, academic and research institutions, the SES, and FEPECS (Figure 1).

The studies involving SES/DF hospitals were conducted in more than one hospital. The SES/DF is responsible for a network of hospitals lo-

cated throughout its Administrative Regions, including: regional hospitals in Asa Norte, Asa Sul, Brazlândia, Ceilândia, Gama, Guará, Paranoá, Planaltina, Samambaia, Santa Maria, Sobradinho, and Taguatinga; five district referral centers (Federal District General Hospital, Brasília Support Hospital, Brasília Maternal and Child Hospital, São Vicente de Paulo Hospital, and Brasília Child Hospital); and two care referral centers (Medical and Psychopedagogical Support Center and Mental Health Institute).

In addition to those mentioned above, research funded by FEPECS encompassed other SES-DF facilities, including: the Subsecretariat for Health Surveillance; São Sebastião Primary Health Center; primary health centers in Cidade Estrutural; Recanto das Emas Urgent Care Center; Federal District Central Public Health Laboratory; and the SES/DF Diabetes, Obesity, and Hypertension Referral Center. Research was also conducted in the ESCS on its undergraduate nursing program, *Fundação Hemocentro de Brasília* (Brasília Blood Foundation), *Escolas Classes* run by the Department of Education, and Brasília University Hospital.

Figure 2 shows the number of projects funded by ESCS/FEPECS and PPSUS/FAP/DF by subagenda. The most prominent research themes funded by FEPECS were women's health, health promotion, and clinical research, while the most common subagendas investigated with funding from PPSUS/DF were noncommunicable diseases, health systems and policy, and communicable diseases.

Figure 3 shows the number of projects funded by ESCS/FEPECS and PPSUS/DF by area of application. The most common areas were health-care for specific population groups, health economics and health technology, and diseases and health problems, for research funded by FEPECS, and assessment of health policy, programs, and services, the health-disease process, and health technology assessment, for projects funded by PPSUS/FAP/DF.

## Discussion

The results of this study show that there has been a continuous flow of resources for health research in the Federal District over recent years. However, funding has not been significant, except for the CFP issued by PPSUS/DF in 2016.

With respect to FEPECS, selected projects have tended to focus on the research demands of

**Table 1.** Summary of calls for proposals issued by PPSUS/DF between 2009 and 2017. Federal District.

Year/Call for proposal	Subagendas	Nº projects	Amount Decit (R\$)	Amount FAP/DF (R\$)	Total Amount (R\$)
CFP PPSUS FAP/DF 04/2009	Noncommunicable diseases, clinical research, communicable diseases, health promotion and diet, nutrition.	8	735,927	367,908.3	1,103,835.3
CFP PPSUS FAP/DF 13/2010	Health systems and policy, mental health, older persons' health, technology assessment and health economics, epidemiology, indigenous peoples' health, diet and nutrition, work management and health education, health communication and information, pharmaceutical care, noncommunicable diseases, health promotion.	21	987,727.6	379,748	1,367,475.6
CFP PPSUS FAP/DF 10/2012 FAP/DF	Communicable diseases, health systems and policy, child and adolescent health, women's health, indigenous peoples' health, oral health.	8	692,463.2	326,614.4	1,019,077.6
CFP PPSUS FAP/DF 03/2014	Health promotion, clinical research, communicable diseases, work management and health education, older persons' health, health of people with special needs, noncommunicable diseases, pharmaceutical care.	15	1,340,557.1	371,520.9	1,712,078
CFP FAP/DF/MS-DECIT/CNPq/SESDF N.º 001/2016	Work management and health education, health systems and policy, communicable diseases, technology assessment and health economics, noncommunicable diseases, clinical research, health communication and information, older persons' health, health of people with special needs.	21	1,197,436.5	1,569,923.2	2,767,359.7
<b>Total (R\$)</b>		<b>73</b>	<b>4,954,111.5</b>	<b>3,015,714.8</b>	<b>7,969,826.2</b>

Source: Decit/SCTIE/MS

hospital facilities in the Federal District, suggesting that themes in the area of public health and human sciences have not awakened the interest of researchers in the SES-DF.

With regard to PPSUS/DF, as in other states, federal universities have greater project development and fundraising capacity. The results show that service centers account for only a limited number of research projects, suggesting that these facilities have limited ability to respond to CFPs or that they participate as partners of project proponents such as universities.

The results also show that the range of subagendas supported by PPSUS/DF in 2010, 2014, and 2016 was particularly wide, resulting in a

broader distribution of resources and providing a boost for emerging health research groups.

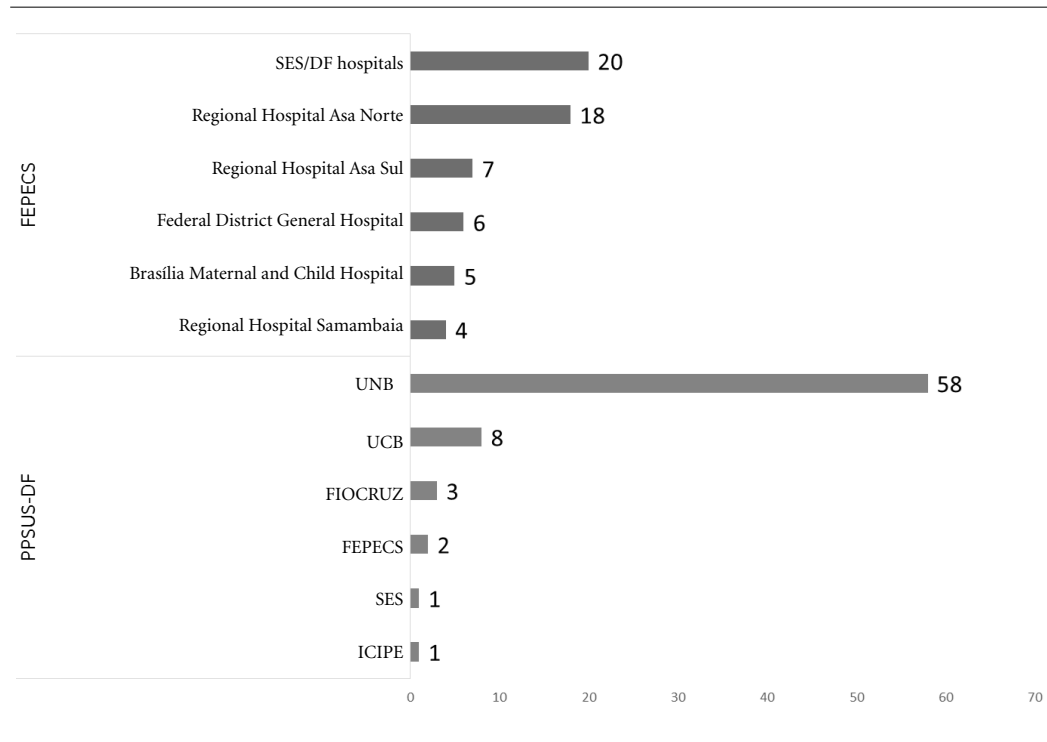
The analysis of the match between subagendas and area of application of research<sup>15</sup> shows that there is a need to give priority to other important themes. According to data from the Innovation in the Management of the SUS Web Portal, the overall mortality rate in the Federal District in 2016 was four deaths per 1,000 population, where the primary cause of death was circulatory diseases, followed by neoplasms and external causes.

With respect to noncommunicable diseases, the findings show that none of the research projects funded by ESCS/FEPECS and PPSUS/DF ad-

**Table 2.** Summary of calls for proposals issued by ESCS/FEPECS between 2008 and 2017. Federal District.

Year/Call for proposal	Year	Number of Projects	Amount (R\$)
CFP N° 57 of 10/29/2008	2008	9	192,699.50
CFP N° 34 of 9/17/2009	2009	11	147,761.15
CFP N° 02 of 3/18/2010	2010	9	139,326.40
CFP N° 53 of 9/22/2010	2011	12	290,256.65
CFP N° 2 of 3/7/2012	2012	9	308,859
CFP N° 18 of 5/2/2013; and CFP N° 41 of 10/2/2013	2013	13	499,831
CFP N° 11 of 9/3/2014	2014	4	171,302
CFP N° 36 of 9/14/2015	2015	5	331,698.21
CFP N° 16 of 8/15/2016	2016	6	300,000
CFP N° 26 of 7/26/2017	2017	7	417,915.30
<b>Total</b>		<b>85</b>	<b>2,799,649.21</b>

Source: ESCS/FEPECS

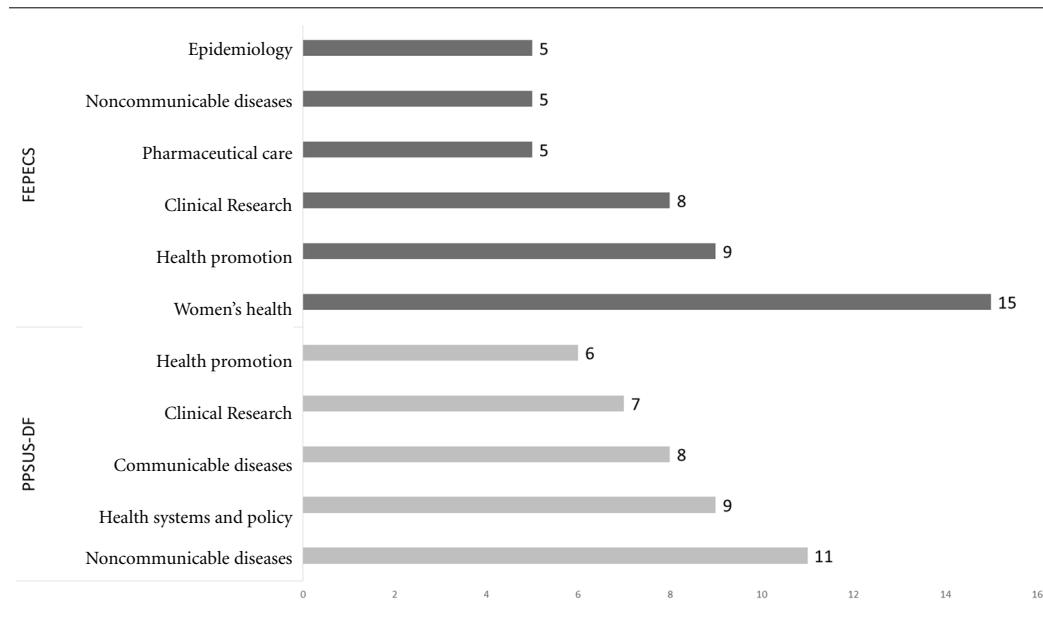
**Figure 1.** Number of projects funded by PPSUS/FAP/DF and FEPECS/ESCS by implementing organization between 2008 and 2017. Federal District.

Source: ESCS/FEPECS/SES-DF, DECIT/SCTIE/MS.

dressed external causes, despite the fact that they are the third leading cause of death in the Federal District, accounting for 15% of all deaths. Statistics for the Federal District show that prevalence of death from external causes is greatest among men. In this respect, according to the World

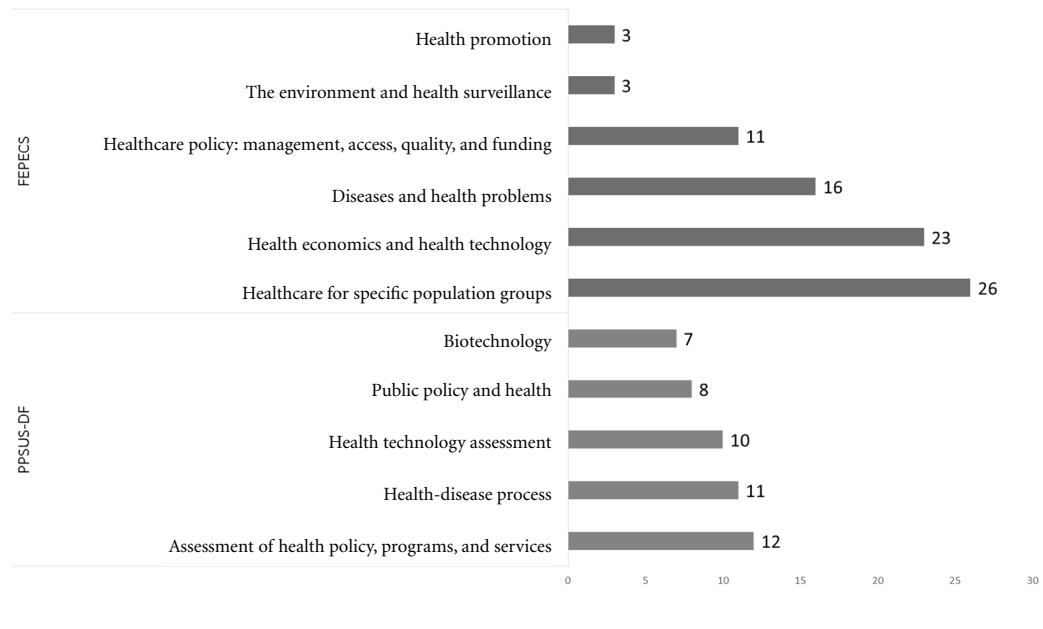
Health Organization, prevalence of death from external causes is greatest among men aged between 20 and 29 years.

Women's health was one of the most prominent themes investigated by the research projects funded by ESCS/FEPECS, which reveals a strong



**Figure 2.** Number of projects funded by ESCS/FEPECS and PPSUS/DF by subagenda between 2008 and 2017. Federal District.

Source: ESCS/FEPECS/SES-DF, DECIT/SCTIE/MS



**Figure 3.** Number of projects funded by ESCS/FEPECS and PPSUS/DF by area of application between 2008 and 2017. Federal District.

Source: ESCS/FEPECS/SES-DF, DECIT/SCTIE/MS.

link with the Federal District's maternal mortality profile. According to data from the Innovation in the Management of the SUS Web Portal, in 2016, the maternal mortality ratio was 48.6 deaths per 100,000 live births, which is high in comparison to rates observed in developed countries. Direct obstetric causes, particularly abortion, gestational hypertension, and complications during delivery and the postpartum period, were shown to be the main causes of death. With respect to infant mortality, incidence of death is highest during the early neonatal period. The majority of deaths are perinatal (66%), with 35% of deaths due to maternal factors and complications during pregnancy and delivery, stressing the importance of improving access to quality antenatal, delivery, and newborn care. Women's health should remain a priority, given that the causes outlined above are preventable and tackling them requires the provision of quality comprehensive services.

A number of important studies concerning health promotion were conducted during the study period, providing stimulus to step up actions in primary healthcare involving both traditional centers and family health teams.

The present study was limited to two health research support programs in the Federal District. The investigation of other possible sources of funding was beyond the scope of this study. One of the limitations of the study is that the funding provided by PPSUS/DF was not compared to other state programs, considering that it is a nationwide program. Another limitation is that we did not analyze the reports of the monitoring and evaluation seminars held by PPSUS/DF for each CFP to verify whether the SES adopted the research output of the projects funded by the program.

Difficulties in evaluating the results of the PPSUS can be explained by cultural differences between the organizations involved in implementing the program and remoteness of SUS administrators from science and technology themes<sup>16</sup>.

Despite these limitations, this analysis provided an important insight into the profile of health research funded by the Federal District's two main research support programs. Health research in Brazil is funded via a range of different funding organizations that tend to act in four core areas: research, researcher training and development, innovation, and scientific events. However, funding tends to be concentrated in states in the Southeast Region, revealing regional imbalances and the need to promote equality in health research<sup>12,14</sup>. A prominent state organization is the São Paulo Research Foundation (FAPESP, acronym in Portuguese), which develops programs in key areas, notably its public policy program, which should be adopted in the Federal District.

## Conclusion

This study provides a critical analysis of the research themes supported by ESCS/FEPECS and PPSUS/DF between 2008 and 2017 based on the main morbidity and mortality indicators in the Federal District. The three leading causes of death and the organization and evaluation of healthcare services should be priorities for future CFPs.

The findings regarding the implementing organizations show the need to intensify partnerships between service centers and the SES and academic and research institutions in the region.

Despite the importance of regional vocations, when elaborating CFPs, health status data should be used as criteria for setting priority themes and delineating research problems to ensure that research addresses the most pressing health issues and needs, thus offering pathways to social development.

The SES-DF should also develop its own policy on science, technology and innovation in health that sets out health research priorities for the SUS-DF.



Future studies should investigate the incorporation of the outputs of research funded by ESCS/FEPECS and PPSUS/DF and health programs, actions, practices, and services.

### **Collaborations**

MRCG Novaes contributed to study conception, the planning and organization of the working group, data analysis and interpretation, and to the critical review and final approval of this manuscript. ML Motta and FTS Elias contributed to study conception, data analysis and interpretation, and to the critical review and final approval of this manuscript. RE Silva contributed to data analysis and interpretation and to the critical review and final approval of this manuscript. CCG Silva and VAT Baliero contributed to data systematization, analysis, and interpretation, and to the final approval of this manuscript. M Tenorio contributed to data systematization and to the final approval of this manuscript.

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