

**PRESENTACIÓN DE LOS RESULTADOS DEL ESTUDIO
SOBRE MEDICINA PERSONALIZADA EN PAÍSES DE
AMÉRICA LATINA Y EL CARIBE / PRESENTATION OF THE
RESULTS OF THE STUDY “MAPPING OF PERSONALISED
MEDICINE IN LAC COUNTRIES”**



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PERSONALISED MEDICINE DEFINITION

The work of the International Consortium for Personalised Medicine **ICPerMed**^[*] is based on the definition of PerMed given in the [European Council Conclusion on personalised medicine for patients \(2015/C 421/03\)](#).

It states “[...] ***that it is widely understood that personalised medicine refers to a medical model using characterisation of individuals’ phenotypes and genotypes (e.g. molecular profiling, medical imaging, lifestyle data) for tailoring the right therapeutic strategy for the right person at the right time, and/or to determine the predisposition to disease and/or to deliver timely and targeted prevention.***”



ICPerMed



What is Personalised Medicine?

- Why does it happen that a treatment for a certain disease works very well for one person, but poorly or not at all for the next person?
- What does our genetic profile tell us about chances and risks for our health?
- Going even further, how can molecular, clinical or lifestyle data support preventing, diagnosing or treating disease?

These are just some of the questions that personalised medicine tries to find answers for.

[*] <https://www.icpermed.eu/>

MAPPING THE SCIENTIFIC LANDSCAPE OF PERMED IN LAC REGION

REVIEW OF POLICY AND FUNDING PROGRAMMES AND RELATED ISSUES TO IT IN LAC COUNTRIES SUPPORTING PERMED AND IDENTIFICATION OF RELEVANT STAKEHOLDERS



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**REPORT: MAPPING THE SCIENTIFIC AND POLICY LANDSCAPE OF PERMED
IN THE LAC REGION, INCLUDING THE IDENTIFICATION OF STAKEHOLDERS**



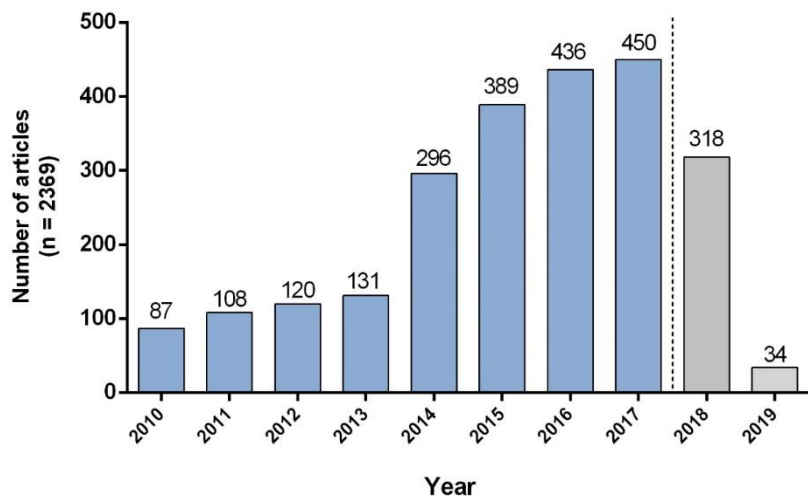
MAPPING THE SCIENTIFIC LANDSCAPE OF PERMED IN LAC REGION

METHODOLOGY

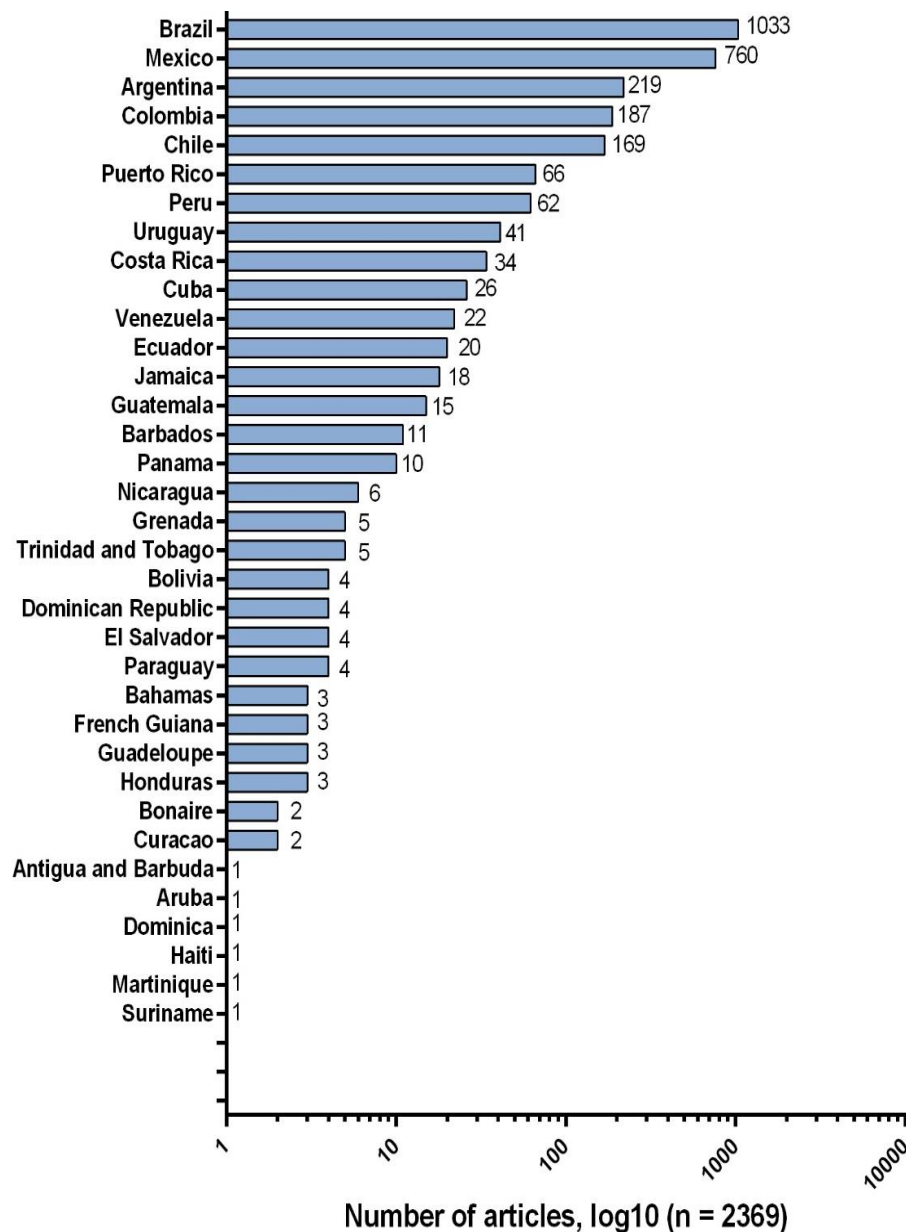
- Use the European Council definition to Personalised Medicine Med but taking into account the complexity of “personalised medicine” multiple meanings and synonyms
- Develop a search strategy for PubMed search engine:
 - Restricting the search to articles published between 01/01/2010 and 12/04/2019 and to “humans”.
 - Selecting the articles with at least one author affiliated to an institution in LAC countries
 - Selecting articles including in the title or abstract the terms: “personalised medicine”, “PerMed”, “medicina personalizada”, “precision medicine”, “genomic medicine”, “medicina genomica”, “individualized medicine”, “stratified medicine”, “precision oncology”, “precision psychiatry”, “genetic screening”, “genetic testing”, “genotipado”, “genotipagem”, “genomic epidemiology”, “molecular epidemiology”, “precision public health”, “pharmacogenetics”, “pharmacogenomics”, “farmacogenetica”, “farmacogenomica”, “genome wide”, “GWAS”, “genome-wide association study”, or “whole genome”
 - Selecting the articles with at least one of the authors belonging to a LAC country including in the the title or the abstract the names of the drugs approved by the U.S. Food and Drug Administration (FDA) that are considered “sensu stricto” precision drugs by the FDA, (all of them are for cancer therapy)
 - Including 20 articles with at least one author affiliated to an institution in LAC countries, on the field of Artificial Intelligence/Machine Learning and related to PerMed, considering that this topic is part of the European Council’s definition of PerMed
- A total of 3091 articles were yielded by this search strategy. As an additional step, we refined the search by verifying titles, abstracts, and affiliations, ending up with a total of **2369 articles**
- As a parallel analysis we retrieved funding information from these articles using the SCOPUS database.

LAC COUNTRIES' SCIENTIFIC PRODUCTION ON PERMED

Articles on personalised medicine with authors/coauthors from LAC countries, 2010-2019

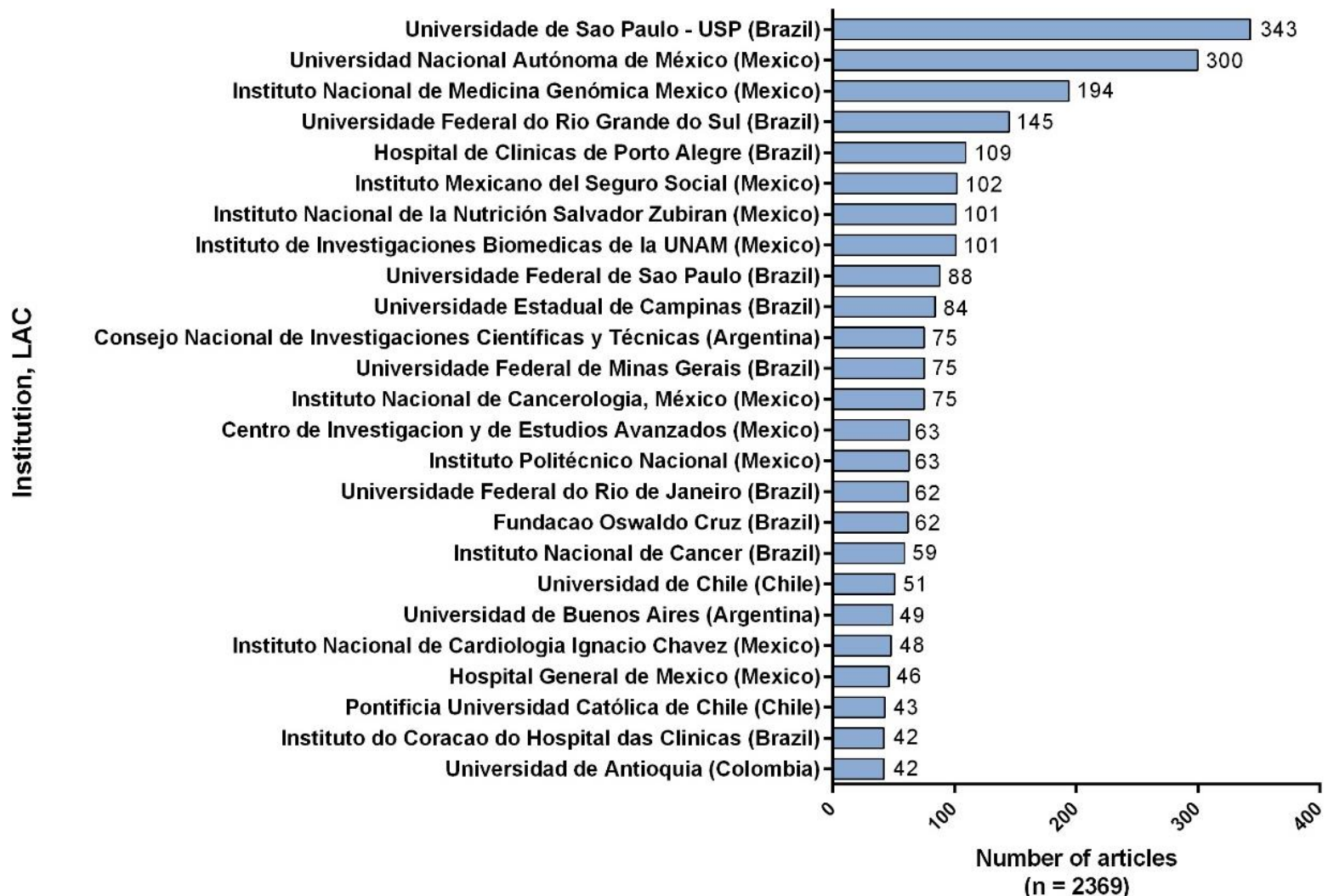


LAC countries



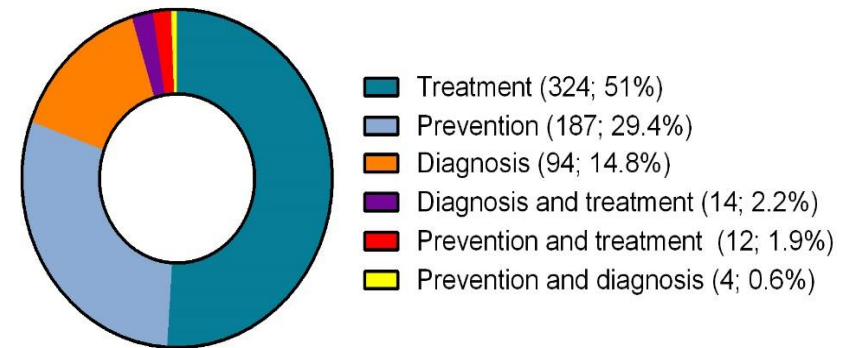
LAC COUNTRIES' SCIENTIFIC PRODUCTION ON PERMED

Top institutions from LAC countries ranked by the number of articles on personalised medicine

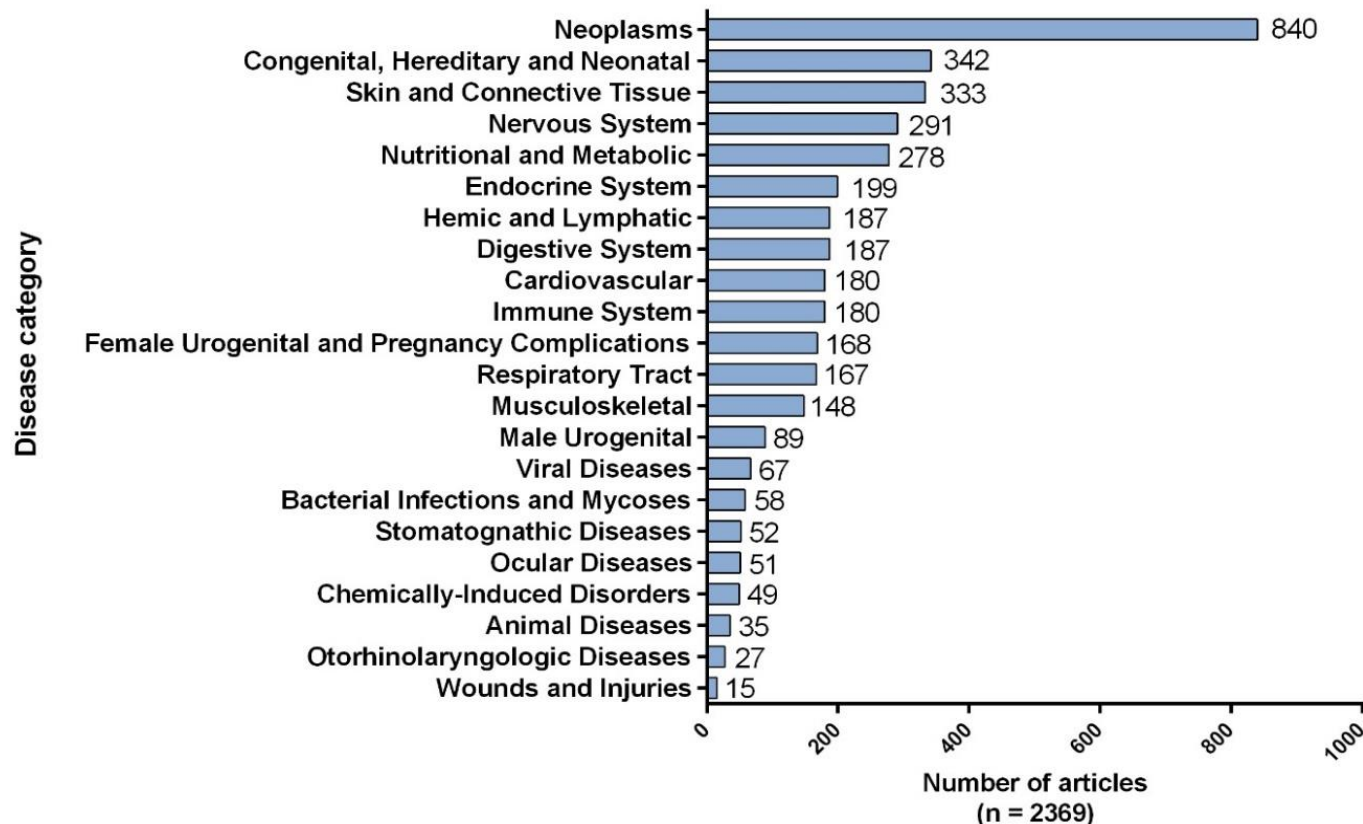


LAC COUNTRIES' SCIENTIFIC PRODUCTION ON PERMED

Articles on personalised medicine
according to disease category (*with LAC
countries as coauthors*)



n = 635 (out of 2369)



LAC COUNTRIES' SCIENTIFIC PRODUCTION ON PERMED

LAC-LAC collaborations on personalised medicine, 2010-2019

			2	47	34	27	9	2		5				1		1	45	4	5	2	25	8		11	6	Argentina
																								1		Aruba
				2		2						1		2	1											Barbados
2				2	2	2	1					1				2					2			1		Bolivia
47		2	2		29	31	6	4		5	1	1		2	2	4	44	4	4	2	24	8	1	16	5	Brazil
34			2	29		19	1	1		2				1			28	1		2	22	4		5	2	Chile
27		2	2	31	19		8	2		3				2	2	1	37	2	2	2	19	5		8	4	Colombia
9			1	6	1	8		2		2	1			6		1	13	4	5		3	3	1	4	2	Costa Rica
2				4	1	2	2			2	1			1			2	2	1	1	2	1	1	1		Cuba
																						3				Dominican Republic
5				5	2	3	2	2									6	2	1	1	3			1		Ecuador
				1			1	1					1					2	1			1	1			El Salvador
				1																						French Guiana
		1																								Guadeloupe
1			1	2	1	2	6	1			1						6	1	1		1	1	1		1	Guatemala
		2		2		2										1										Honduras
1		1		4		1	1							1			1		1							Jamaica
45			2	44	28	37	13	2		6				6		1		4	4	2	24	6		14	7	Mexico
4				4	1	2	4	2		2	2			1			4		3		2	1	1	2	1	Nicaragua
5				4		2	5	1		1	1			1		1	4	3			1	1	1	2	3	Panama
2				2	2	2		1		1							2				2				1	Paraguay
25			2	24	22	19	3	2		3				1			24	2	1	2		2		3	2	Peru
8				8	4	5	3	1	3		1			1			6	1	1		2		1			Puerto Rico
				1			1	1			1			1				1	1			1				Trinidad and Tobago
11			1	16	5	8	4	1		1							14	2	2		3				3	Uruguay
6	1			5	2	4	2							1			7	1	3	1	2			3		Venezuela
Argentina	Aruba	Barbados	Bolivia	Brazil	Chile	Colombia	Costa Rica	Cuba	Dominican Republic	Ecuador	El Salvador	French Guiana	Guadeloupe	Guatemala	Honduras	Jamaica	Mexico	Nicaragua	Panama	Paraguay	Peru	Puerto Rico	Trinidad and Tobago	Uruguay	Venezuela	

LAC-Europe collaborations on personalised medicine, 2010-2019

[illegible]

LAC COUNTRIES' SCIENTIFIC PRODUCTION ON PERMED

Institutions funding personalized medicine research in LAC countries

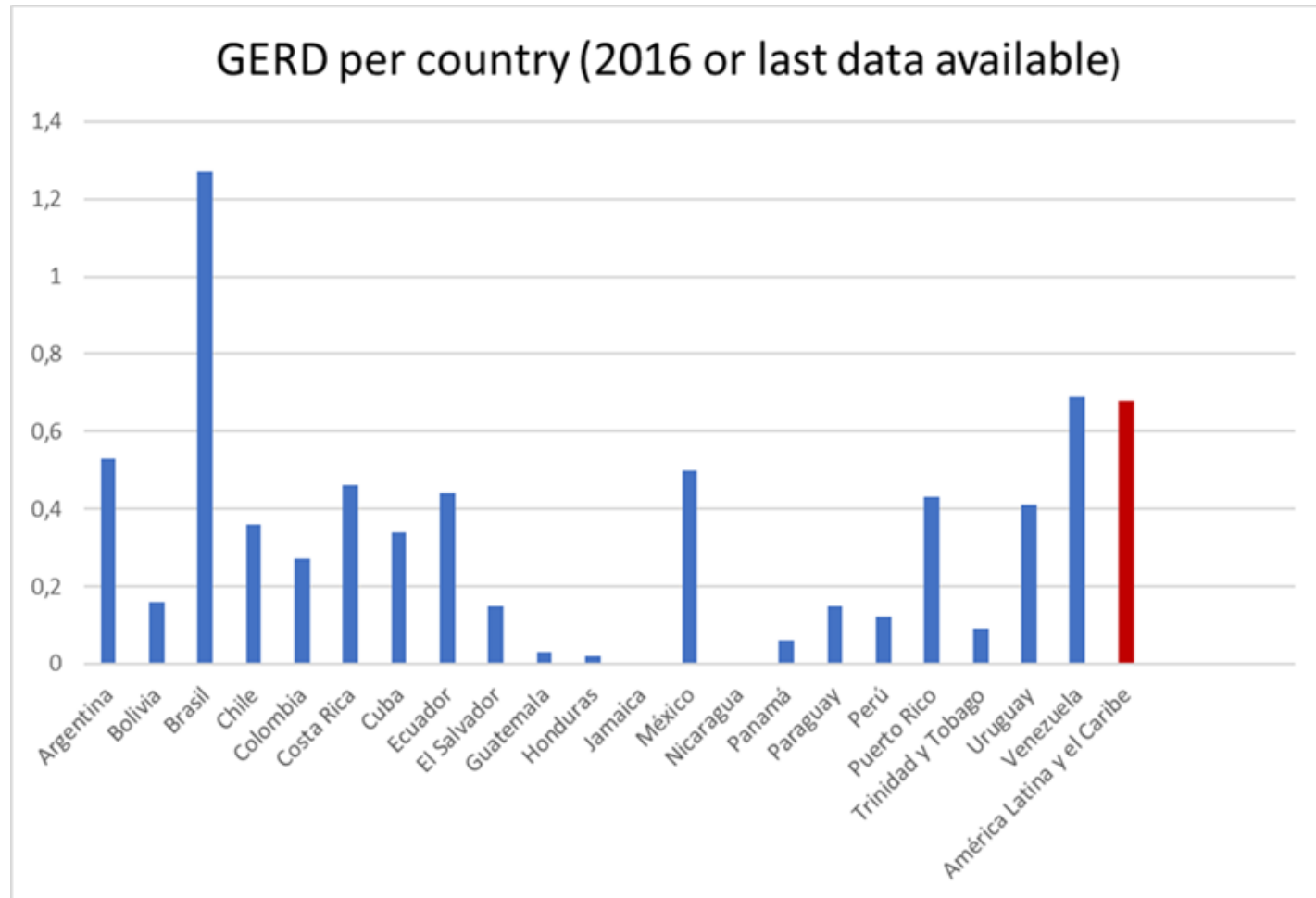
COUNTRY	LAC PUBLIC FUNDING INSTITUTIONS	NUM. ARTICLES
ARGENTINA	Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET)	15
	Agencia Nacional de Promoción Científica y Tecnológica (ANPCYT)	8
BRAZIL	Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq)	152
	Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP)	102
	Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES)	68
	Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro	22
	Fundação de Amparo à Pesquisa do Estado do Rio Grande do Sul	17
	Fundação de Amparo à Pesquisa do Estado de Minas Gerais	12
	Associação Fundo de Incentivo à Pesquisa (AFIP)	7
	Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco	7
	Financiadora de Estudos e Projetos (FINEP)	6
	Fundação de Amparo à Pesquisa do Estado de Goiás	3
	Fundação Oswaldo Cruz (FIOCRUZ)	2
	Fondo Nacional de Desarrollo Científico y Tecnológico (FONDECYT)	11
CHILE	Comisión Nacional de Investigación Científica y Tecnológica (CONICYT)	6
	Corporación de Fomento de la Producción (CORFO)	1
	Departamento Administrativo de Ciencia, Tecnología e Innovación (COLCIENCIAS)	9
COLOMBIA		
COSTA RICA	Consejo Nacional de Investigaciones Científicas y Tecnológicas (CONICIT)	1
CUBA	Ministry of Public Health	1
	Ministry of Education, Science and Technology (MEST)	1
MEXICO	Consejo Nacional de Ciencia y Tecnología (CONACYT)	144
	Proyectos PAPIT [Universidad Nacional Autónoma de México]	18
	Instituto Mexicano del Seguro Social	10
	Instituto Nacional de Perinatología	9
	Instituto Nacional de Salud Pública (INSP)	2
PUERTO RICO	National Institutes of Health (NIH)	6
PANAMA	Secretaría Nacional de Ciencia, Tecnología e Innovación (SENACYT)	1
URUGUAY	Agencia Nacional de Investigación e Innovación (ANII)	7
	Comisión Sectorial de Investigación Científica (CSIC) de la Universidad de la República	3
	Programa de Desarrollo de las Ciencias Básicas (PEDECIBA) [Ministry of Education and Univ. de la República]	1

REVIEW OF POLICY AND FUNDING PROGRAMMES IN LAC COUNTRIES SUPPORTING PERMED AND IDENTIFICATION OF RELEVANT STAKEHOLDERS

METHODOLOGY

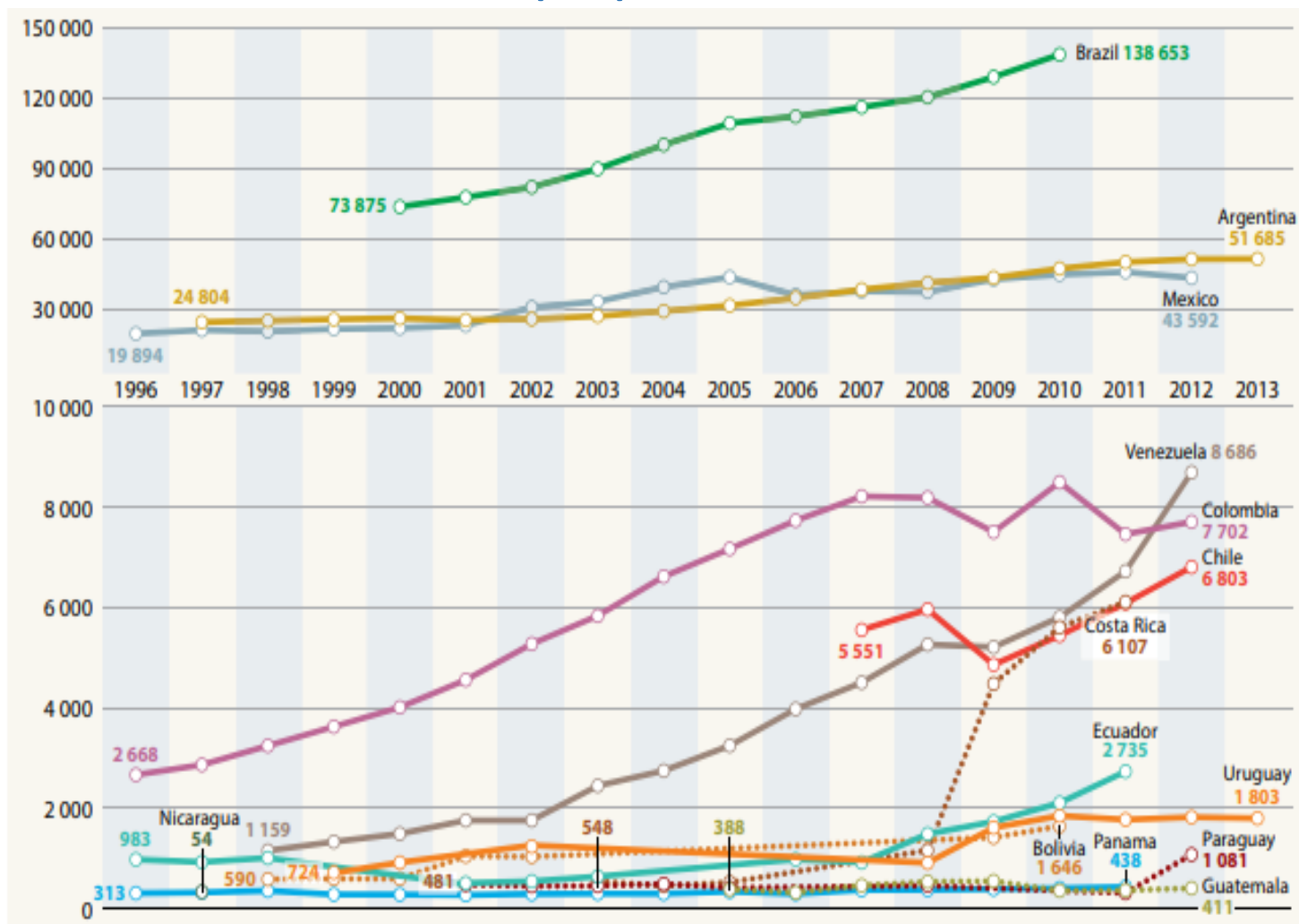
- **Internet searches for official websites, review of national policy documents, research agendas and scientific articles. For each LAC country, we have searched for and identified:**
 - Organizations in charge of S&T policy
 - S&T funding organizations
 - Existence of a national S&T policy
 - Programmes and funding mechanisms for health research
 - Specific funding for personalized medicine (*projects, training activities and/or infrastructures*)
- **A short survey was launched during the months of April/May 2019. It had as main target audiences the following LAC stakeholders:**
 - R&D funding agencies and/or Ministries
 - Ministries of Health (*support from RIMAIS*)
 - Health technology assessment departments
 - Medicines agencies

GROSS DOMESTIC EXPENDITURE ON R&D (GERD) PER LAC COUNTRY, AS % OF GDP, DATA FOR 2016 OR LAST YEAR AVAILABLE



Source RICYT (Notes: Jamaica and Nicaragua data not available. Trinidad and Tobago is the only CARICOM country reporting R&D data)

RESEARCHERS (FTE) IN LATIN AMERICA 1996-2013



Source UNESCO 2015 (<https://unesdoc.unesco.org/ark:/48223/pf0000265331>)

HEALTH RESEARCH IN LAC

COUNTRY	GERD medical and Health science (in '000current PPP\$)	Last year available
Argentina	262.312	2016
Chile	157.793	2016
Uruguay	56.335	2016
Ecuador	37.929	2014
Perú	32.855	2016
Paraguay	17.446	2016
Costa Rica	14.400	2016
Guatemala	10.006	2015
El Salvador	7.949	2016
Trinidad and Tobago	3.011	2016
Honduras	354	2015

Source: UNESCO Science, technology and innovation Dataset

HEALTH RESEARCH IN LAC

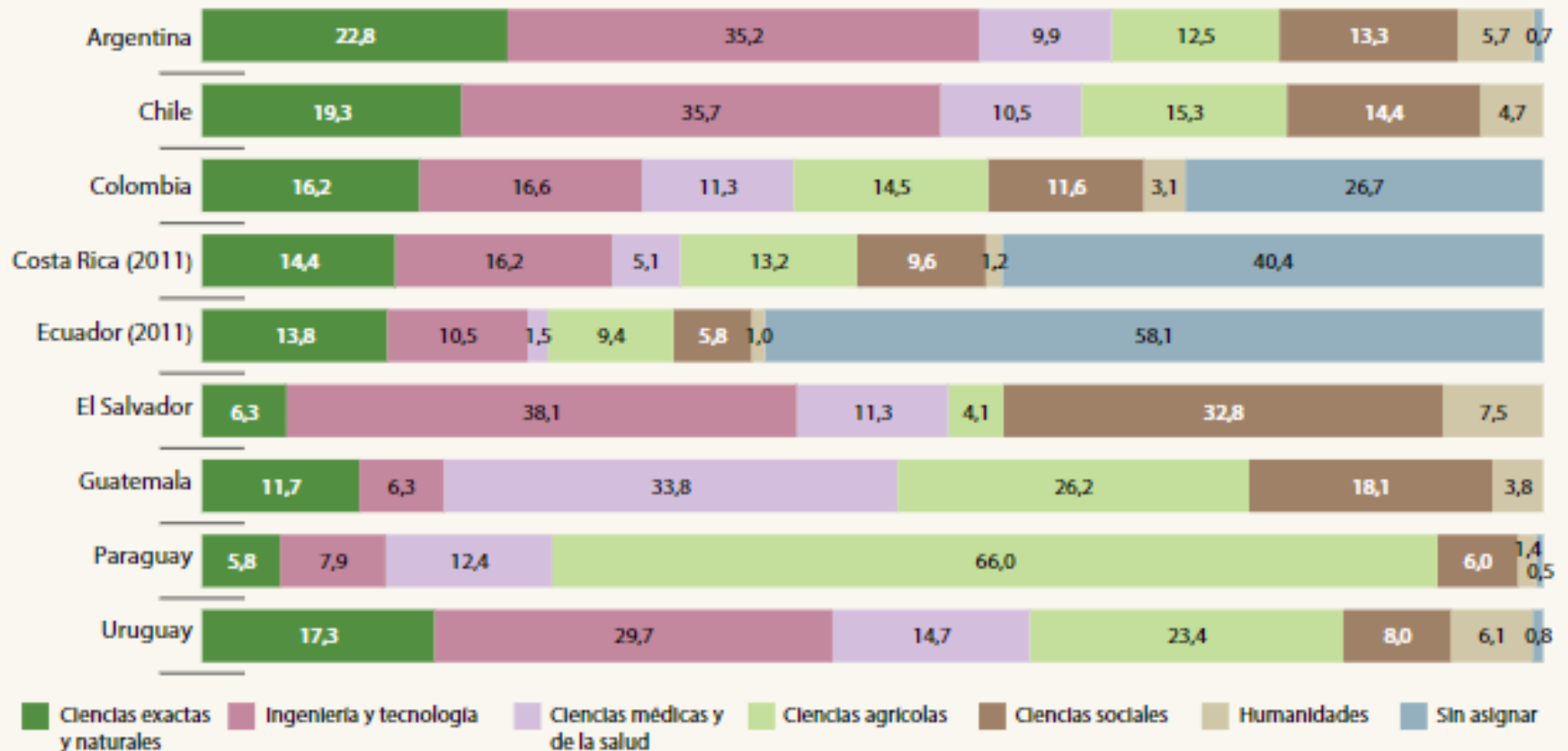
COUNTRY	Health researchers (in full-time equivalent) for the most recent year with data since 2010	
	Total number	per million inhabitants
Uruguay	276	80
Chile	791	44
Ecuador	680	42
Colombia	1096	23
Bolivia	203	19
Guatemala	185	11
El Salvador	54	9

Data available on health researchers for different LAC countries (2010 or recent data)

Source: WHO global Observatory on Health R&D

HEALTH AND MEDICAL RESEARCH SPENDING IN COMPARISON WITH OTHER SECTORS

GBID por campo de la ciencia, 2012 (%)



Source UNESCO 2015 (<https://unesdoc.unesco.org/ark:/48223/pf0000265331>)

WHO DEFINES POLICIES AND FUNDS HEALTH RESEARCH IN LAC: MAIN ACTORS

- **The Ministry of Health** is the administrative body most often responsible for governing clinical and public health research (setting policies, priorities, financing, etc.) and using the country's health policy or plan to set directions for it
- **The Science and Technology (S&T) sector, which is represented by specialized agencies** (with different status in each country), is mostly responsible for basic and biomedical research financing, as well as efforts towards innovation

PERSONALIZED MEDICINE IN LATIN AMERICA AND THE CARIBBEAN: MAIN FINDINGS

- In general, personalized medicine, as such, is not a priority area in health research and innovation policy in Latin America and the Caribbean
- Very few countries have specific R&D funding programmes explicitly mentioning personalized medicine (or related names). From the information collected, specific programmes or funding for PM have only been found in Cuba, Argentina, Brazil and Mexico.
- In another group of countries, PM-related projects are funded but as part of the health research programmes, or have PM initiatives set up (i.e. Chile, Colombia)
- National health research priorities are established by the Ministries of Health, and can be funded by this Ministry and/or the Ministry or Agency in charge of S&T funding. In the majority of LAC countries, the Health Research Agenda is disease-focused, that is, prioritized areas for research are related to major health problems in the countries (*infectious diseases, maternal and child health, etc.*) as well as access to health and social determinants for health
- Personalized medicine issues are mentioned as areas of interest for basic research in health research agendas, mainly related to cancer research (*for example, strategies for molecular characterization of frequent cancers*) in some of the countries who have recently carried out priority-setting exercises for health research (*i.e. Colombia, Costa Rica, Ecuador, Panamá, Perú and Uruguay*)

PROPOSED GROUPING OF LAC COUNTRIES IN RELATION WITH THE ACTUAL SCIENTIFIC AND POLICY SITUATION OF PERSONALIZED MEDICINE

GROUP 1	<ul style="list-style-type: none"> • Specific funding programmes for PM are available • A national PM strategy exists or PM is explicitly mentioned as an area of research in the STI and/or health plans • Relevant organizations working in PM and funded through public funds exists • >200 research articles on PM identified in PubMed database 	Argentina Brazil Cuba México
GROUP 2	<ul style="list-style-type: none"> • No specific funding programme but PM research projects are funded through the available STI funding programmes. • PM research initiatives at country level exist (PM research centers, Wide population genome projects, genome sequencing facilities) • PM (or precision medicine, genetic/genomic medicine or similar) is mentioned in the national STI policy documents and/or in the health research plans. • Between 10-200 research articles on PubMed 	Chile Colombia Costa Rica Ecuador Panamá Perú Uruguay Venezuela (*)
GROUP 3	<ul style="list-style-type: none"> • No specific funds from public authorities are available • PM is not mentioned in the STI policy documents • No PM initiatives have been found • No research articles in the PubMed database have been identified 	Dominican Republic Caribbean Countries Bolivia El Salvador Guatemala Nicaragua Paraguay

Inclusion in each group is done when countries comply with at least 3 of the 4 selected criteria

(*) explanatory note: Information about Venezuela's S&T policy and funding activities is scarce and difficult to find in Internet

D2.1: MAPPING THE SCIENTIFIC AND POLICY LANDSCAPE OF PERMED IN THE LAC REGION, INCLUDING THE IDENTIFICATION OF STAKEHOLDERS

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Thank you very much

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