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Primary Health Care sustainability in rural remote territories at the fluvial Amazon: organization, strategies, and challenges

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Abstract *The article analyzes singularities of the Primary Health Care (PHC) organization in rural remote municipalities (RRM) in the Amazon under the influence of rivers and discusses challenges for comprehensive care in the Unified Health System (SUS). This is a qualitative and quantitative study of multiple cases in seven RRM through the analysis of interviews with managers, visits to services and secondary data. The RRM of the fluvial Amazon are small, with a sparse, dispersed population living in conditions of social vulnerability. Long distances, rivers and transport irregularities interfere with access to PHC services. The Family Health Strategy is implemented in the municipal system, however areas without assistance coverage, unavailability of PHC services and adaptations to the Strategy imposed by the characteristics of the context remain. The challenges are related to the financing, provision and fixation of the workforce and barriers of geographic access compromise the PHC response capacity in SUS. PHC sustainability requires strategic measures, resources and actions from multiple sectors and public agents; national support policies with feasibility for local execution, so that PHC services are established and make sense in such unique spaces.*

Key words *Primary health care, Rural health, Amazônia*

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Introduction

Dilemmas regarding the organization and availability of health services in areas outside of the urban axis, with low demographic density and small populations are not exclusive to Brazil. Despite the differences between countries, access in rural remote areas is critical throughout the world[1]. These contexts are shaped by singular geographical, environmental, political, economic, historical, cultural, and social factors that are interconnected and that together create a complex scenario for the development of health practices and access[1,2].

Western countries such as Canada and Australia with large territories, dispersed populations and isolated areas have advanced the proposal of policies to ensure viable healthcare in remote areas. The models proposed for these contexts attempt to make adjustments between providing primary healthcare, geographical access conditions, and local needs[3]. The main challenges are related to socioeconomic disadvantages of rural populations, poor distribution of the workforce, and lack of health resources[4-6]. In spite of advancements that followed specific policies for rural remote locations, access is still a critical aspect in work systems designed to ensure equitable providing of suitable primary health[3,7]. Significant gaps remain between community expectations and the actual providing of health services[8].

In Brazil, the definition of rural remote areas is fairly recent, evidence of the incipience of public policies specific for these contexts. The Brazilian Amazon is a territory marked by rarefied population, huge distances, and isolation. In a part of this territory, rivers are the only mobility route. Studies show a detachment between national policies and local realities, suggesting it is imperative to build differentiated policies within the region[9-11].

What would therefore be the challenges and strategies of municipal management to give sustainability to primary health services in rural remote territories of the Brazilian Amazon? Which organizational elements help or make difficult primary health service capacity to respond in the Unified Health System (SUS)?

The goal of this paper is to analyze the singularities of primary health service organization in rural remote municipalities in the Amazon, in places with strong influence of river dynamics, and discuss the challenges to ensure full SUS service in these territories.

Methodological aspects

This article discusses part of the results of the "Primary Healthcare and rural remote territories in Brazil), whose goal was to analyze the singularities of organization and of use of primary healthcare services in rural remote territories in Brazil. The study characterized the 323 rural remote municipalities (RRM) according to the IBGE[12] classification, which we then typified in six areas with peculiar socio-spatial dynamics: Semi-Arid Region; Matopiba; Center-West Expansion Vector; Northern Minas Gerais; North Waters, and North Highway[13].

To define the sample, we characterized the 62 North Waters RRM, considering demographic, economic and social features of these municipalities. We then intentionally selected RRM with more common and uncommon characteristics in the North Waters territory, so as to include municipalities of different states, with diversified characteristics. We eventually achieved a sample of seven RRM: Prainha, Curuá, Aveiro, Melgaço, in the state of Pará; Maués and Boa Vista do Ramos, in the state of Amazonas; and Vitória do Jari, in the state of Amapá.

This article analyzes the singularities of public healthcare organization in seven RRM, the factors and processes that facilitate or hamper its implementation, and the challenges to ensure access to primary healthcare. This is a study with multiple cases, with a qualitative-quantitative approach, by means of semi structured interviews and publicly accessible secondary data.

Thirteen interviews with Municipal Secretaries of Health (6) and with Primary Health Coordinators (7) were analyzed. Among those interviewed, most were women (9), especially in the Primary Health Coordination (6). These managers are mostly between 30 and 40 years old (9); have college degrees, with a predominance of nursing (10); have held their degrees for more than 10 years (9); have worked in management between 3 months a 1 year (6) and 2 to 4 years (7); and had previous experience in management before taking up the job (7). Municipal Health Secretaries had commissioned posts, while Primary Healthcare Coordinators had a fixed-term contract (4) or were Municipal Government employees (3).

Data was collected between May and November 2019, with visitations to the municipalities and Basic Health Units (UBS) of the town area and of the hinterland of each municipality under study, and in-person interviews recorded with

municipal health managers on the organization, strategies, and challenges of primary healthcare in the SUS, with an average duration of two and a half hours, later transcribed in full to produce data and categorize their content.

The interviews were guided by semi structured and multidimensional guide, designed to create triangulated and transversal analysis possibilities, encompassing the maximum amount of information for the analysis of multiple cases in depth[14].

Thematic content analysis was used to elaborate the results. After reading the empirical material, we identified themes related to the provision and access to primary healthcare. The second phase of the reading involved summing up and interpreting the material, later organized in three thematic dimensions that structured the presentation of the results: socio-spatial characteristics of the rural remote municipalities, consisting of socioeconomic and demographic aspects and of geographical access; primary healthcare via municipal SUS, encompassing coverage and (un) availability of services, and adaptations of the National Policy for Basic Healthcare (PNAB) guidelines to the Amazon reality - multiple primary healthcare formats; and challenges to ensure access to primary healthcare, encompassing supply and offer of primary healthcare services; provision and fixation of professionals; geographical access and mobility for healthcare.

For the socio-spatial characterization of the RRM, coverage and availability of municipal SUS services, in addition to primary sources we also used publicly accessible secondary data: Brazilian Institute of Geography and Statistics; National Registry System for Health Facilities; Primary Healthcare Information System; and other information available in publicly accessible databases; Ministry for Social Development; Accounting and Fiscal Information System for the Brazilian Public Sector.

The study was approved by the Committee for Ethics in Research of the Sergio Arouca National Public School – CEP/ENSP/FIOCRUZ, CAAE 92280918.3.0000.5240 and decision no. 2.832.559.

Results

Socio-spatial characteristics of rural remote municipalities

Socio-economic and demographic aspects

The seven RRM under study are immersed in the vast Amazon territory. Some of them encompass environmental protection areas and use rivers as the common thread of the social and economic organization of local communities. The same water that floods the flatlands disappears in the receding periods. Traditional peoples have lived in these municipalities before they were even conceived as administrative units (states). Riverside communities inhabited by fishermen, farmers and extractivits characterize the way of life of the population living in the hinterland, out of the towns.

Rivers provide mobility, attract people, and make communication possible between the different social spaces. They are responsible for most of the income of these riverside populations, seasonally transforming the land, the usage of space, and the way of life of this population, which is constant adapting to its surroundings[15,16].

Although these RRM share many features, they also differ in terms of means of access, characteristics of the population, and how they use their territories. Table 1 information on the socioeconomic and demographic characteristics of the RRM in the territory we will be calling fluvial Amazon here.

These are small municipalities with remote areas that are difficult to access, almost all with more than half of their population living out of the municipality seat. Soarsed, dispersed population is a common phenomenon in the hinterlands. Municipalities with larger territories are also the ones with more rarefied populations.

RRM are not very attractive and are marked by significant social vulnerability. Local economy is supported by intergovernmental fund transfers and by public administration activities. Agriculture, livestock farming, fishing and extractivism are mainly family businesses and an important means of subsistence for the hinterland population.

Environmental issues are very expressive in these municipalities (conflicts over land, deforestation, river pollution) and have impact on conditions of life and health for these populations.

Table 1. Social. demographic. and environmental characteristics; rural remote municipalities in the fluvial Amazon. Brazil. 2019

Municipalities / Territory characteristics	Boa Vista do Ramos (AM)	Maués (AM)	Aveiro (PA)	Curuá (PA)	Prainha (PA)	Melgaço (PA)	Vitória do Jari (AP)
Estimated population (inhabitants) 1	19.207	63.905	16.388	14.393	29.866	27.654	15.931
% of rural population [2]	53%	52%	87%	53%	73%	78%	18%
Registered and bound population [3]	8.997	30.756	5.069	9.757	19.688	2.666	9.019
Area (km2) [4]	2,586.8 km²	39,989.9 km²	17,073.8 km²	1,431.2 km²	14,786.7 km²	6.774 km²	2,482.9 km²
Demographic density (inhabitants/km2) [4]	5.79 hab/km²	1.31 hab/km²	0.93 hab/km²	8.56 hab/km²	1.98 hab/km²	3.66 hab/km²	5.01 hab/km²
MHDI [4]	0.57 (Baixo)	0.59 (Baixo)	0.54 (Baixo)	0.58 (Baixo)	0.52 (Baixo)	0.41 (Muito Baixo)	0.58 (Baixo)
Income per capita [4]	R$175,55	R$ 244,30	R$ 148,71	R$180,94	R$ 193,32	R$ 135,21	R$ 309,39
% of population receiving PBF [5]	52.22	57.71	48.77	62.21	94.23	70.29	56.04
% of population with private healthcare plan [6]	0.19	0.70	0.43	0.30	0.18	0.04	3.10
Household income below 1/2 minimum wage [7]	82.02	76.63	84.84	84.05	83.00	89.38	68.47
% of population in households with indoor plumbing 1	36.65	40.49	24.13	19.07	16.04	13.39	24.90
Illiteracy Rate - % of population 15 years and older [4]	7.97	10.28	13.71	14.43	17.41	36.68	14.72
% of population in households with electricity [4]	77.04	76.82	76.24	84.40	63.39	64.06	94.11
% of population in households covered by waste collection [4]	88.32	97.43	53.95	36.72	50.90	83.13	99.83
% of extremely poor [4]	40.05	34.31	41.63	38.99	42.50	43.92	22.33
% of public administration And social security in the national GP [7]	60	56	42	52	39	68	73
% Revenues transf. Between governments [7]	85.99	60.40	98.54	97.83	96.45	99.06	94.27
Area of environmental conservation [2]	None	State Forest of Maués; Pau-Rosas National Forest; and Andirá-Marau indigenous land	Tapajós National Forest (FLONA); Andirá-Marau Indigenous Land, and National Amazon Park	None	Renascer Extractivist Reserve	Gurupá-Melgaço Extractivist Reserve; and Caxiuanã National Forest	Jari Ecological Station (out of the municipality)

Legend: Bolsa Família aid program (PBF); Municipal Human Development Index (IDHM)

Source: [1] IBGE - Brazilian Institute of Geography and Statistics – December 2019; [2] MOPS - Strategic Maps for Citizenship Policies - December 2019; [3] SISAB – Health Information System for Primary Healthcare, Registration Panel. 1st quarter of 2020; [4] UNDP - Atlas of Human Development in Brazil – Census, 2010; [5] MDS - Ministry for Social Development, Bolsa Família panel and Unified Registry in its municipality – December 2019; [6] ANS - National Agency for Supplementary Health – December 2019; [7] SICONFI - Secretary of National Treasury - December /2019.

Geographical access

The long distances covered between the hinterland and the municipality seat, and the time required to do so are not always the same. Table 2 modes of transportation normally employed by users searching for health services, showing that in these contexts there is an intrinsic relationship between mode of transportation, time, and cost.

River regime, type of vessel, number of people and amount of goods carried are all variants that alter travel times. When rivers are high, navigation is easier, and traffic is better. Land accesses are harder to reach in the rainy season. Travel times are subject to the means of transportation and road conditions. The phenomenon of river flooding has an impact on the migration of families, as riverside areas are flooded.

When rivers are low, it is harder to navigate, and travel is more difficult. Isolation, an everyday condition, becomes extreme in this period, hampering mobility even further for riverside populations.

The irregularity in the transportation system makes it harder to connect hinterland areas and the municipal seat and the rest of the region, a situation that limits or prevents mobility for people to access services available only in more concentrated areas.

Primary healthcare at the municipal SUS

Service coverage and availability

At RRM, primary healthcare is organized according to the guidelines of the Family Health Strategy (ESF) proposed by the Ministry of Health (MS), with a potential populational coverage between 69 and 100%. As can be seen in Table 3, in all municipalities there are Basic Health Units with Family Health Teams (EqSF), complete with physicians of the Mais Médicos Program (PMM), community health agents (ACS) and Oral Health Teams (EqSB), in addition to other types of teams (fluvial EqSF, riverside EqSF, teams of community health agents - EACS), also determined and financed by the MS. The Nucleus for Support to Family Health (NASF), a device to expand coverage and improve the problem-solving capacity of primary health services, is present in municipalities, with particularities.

Table 2. Habitual travel forms employed by users to the closest Basic Health Unit, rural remote municipalities in the fluvial Amazon, Brazil, 2019.

Municipalities	Boa Vista do Ramos (AM)		Maués (AM)		Aveiro (PA)		Curuá (PA)		Prainha (PA)		Melgaço (PA)		Vitória do Jari (AP)	
	Seat	Hinterland	Seat	Hinterland	Seat	Hinterland	Seat	Hinterland	Seat	Hinterland	Seat	Hinterland	Seat	Hinterland
Formas habituais de deslocamentos	A pé; moto	Moto e embarcações*	A pé; embarcações*	Embarcações*	A pé e embarcações*	Motos / mototáxi, a cavalo ou embarcações*	A pé; moto	Moto e embarcações*	A pé; Moto; carro	Moto; carro ou transporte escolar	A pé	Embarcações*	A pé	Embarcações*
Tempo gasto pelo usuário para acessar a UBS	00:40	12h:00	2h:30	24h:00	1h:00	4h:00	00:40	12h:00	1h:00	4h:00	00:40	16h:00	00:30	8h:00
Custo com condução para ir e voltar da UBS (R$)?	6,00	100,00	40,00	400,00	10,00	60,00	6,00	100,00	8,00	-	6,00	200,00	-	480,00

Legend: * River vessels: These can be of different types, such as Line boats (boats with fixed routes and fees); recreational boats (used for sports or leisure. However, in the region the term also applies to vessels that transport passengers and goods); cargo and passenger boats (also known as mixed boats, that transport good and passengers from one locality to another (point-to-point). Motorboats (including the so-called voadeiras, rabetas, and rabetinhas. These are boats with couples propulsion engines. Rabetinhas are more simplified in shape); Canoe (this is the smallest type of vessel, simpler and more moved by oars); Bajara (very similar to canoes but covered with a canvas); Rabeta or Motor (the difference between the two is whether the engine is fixed to the vessel or not). The usual have less powerful engines, which makes them slower.

Source: Database of the research "Primary Healthcare in rural remote territories in Brazil".

Table 3. Primary Healthcare Indicators and characterization of health equipment, rural remote municipalities in fluvial Amazon, Brazil, 2019.

Municipality / Primary Healthcare Indicators	Boa Vista do Ramos (AM)	Maués (AM)	Aveiro (PA)	Curuá (PA)	Prainha (PA)	Melgaço (PA)	Vitória do Jari (AP)
Total number of UBS/Health Units[1]	3	12	6	7	12	10	7
Total number of EqSF[2]	6	15	6	5	6	5	6
Number of Fluvial ESF[2]	-	1	-	-	-	1	-
Number of Riverside ESF[2]	4	1	-	1	-	2	-
Number of Oral Health Teams[2]	1	10	1	1	4	1	3
Number of EACS[2]	-	-	-	1	3	2	-
Number of NASF[2]	1	1	-	1	-	1	1
Number of Community Health Agents[2a]	61	148	54	34	94	66	51
ESF Coverage[3]	100 %	93.46 %	100 %	100 %	69.26 %	75.51 %	100%
Characteristics of health equipment							
Small Hospital[2]	01	01	-	-	-	01	-
Number of beds[2]	22	90	-	-	31	16	08
Mixed Unit[2]	-	-	01	01	01	-	01
Fluvial Unit[2]	-	01	-	-	-	01	-
Moving Land Unit[2]	-	-	01	01	01	-	-
SAMU [2]	-	-	-	-	-	-	-
Indigenous Healthcare Unit[2]	-	05	-	-	-	-	-
Health Surveillance Unit[2]	01	01	-	01	-	01	01
CEO[2]	-	01	-	-	-	-	-
CAPS[2]	01	01	-	-	-	01	-
Pharmacy[2]	-	01	-	-	-	-	-
Clinic/Specialty Center[2]	-	03	-	-	-	-	-
Health academy[2]	01	01	-	-	01	01	-

Legend: Basic Health Unit (UBS) | Family Health (EqSF) | Family Health Strategy (ESF) | Community Health Agents Strategy (EACS) | Nucleus of Support to Family Health (NASF) | Mobile Urgent Care (SAMU) | Odontology Specialty Centers (CEO) | Psychosocial Care Centers (CAPS).

Source: [1] Research database; [2] SCNES – National Registry of Health Facilities – 2019; [3] Primary Healthcare e-Manager – Primary Healthcare Information and Management – 2019.

Primary healthcare are the only, main and first resource users seek when they need healthcare. Although ESF is implemented at RRM, primary healthcare provision in more remote, less accessible areas is challenging when the goal is universal coverage. The difficulties involved in making primary healthcare available in hard-to-reach areas with rarefied population lead municipal managers to create organizational alternatives from within ESF. In any case, some areas remain devoid of healthcare coverage.

The financing and organization model proposed for primary healthcare proves to be limited in these contexts, in face of the challenges involved in the registration and offer of services for families who live in isolated areas. The existence of indigenous populations that are not taken into account for ESF coverage is another issue that has an impact on the calculation of primary healthcare coverage and financing.

Municipal health systems encompass different kinds of structures for the offer of primary healthcare services: Conventional UBS, small health units, fluvial units, moving land units. They all have some kind of structure to carry out first aid in emergency situations, including low-risk childbirth (Prainha). First-aid services were also mentioned as an access option on days and times when UBS are not open, or when they are closer than UBS.

In most cases, these are services with little problem-solving capacity, structured in health centers or mixed units that are active 24/7 with physicians, nursing professionals (nurses and

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nursing technicians), in some cases without physician. Three municipalities have a small hospital with 24/7 service, which is open for urgencies and emergencies and has obstetrics, clinical and surgical beds (Maués, Boa Vista do Ramos and Melgaço). Health Academy, Psychosocial Care Centers (CAPS) and Odontology Specialty Centers (CEO) are less commonly present in municipalities.

As for binding and territorialization, it was observed that at the municipal seat the population is bound to the reference EqSF by defined areas of actuation. In the hinterlands, the logic of submission is rarely maintained: users who reside in the hinterlands are often bound to teams that work in UBS located at the municipal seat. To make access and availability of the offer viable for the entire population, in some municipalities certain services are concentrated in larger, more centrally located UBS, such as oral health in Melgaço and gynecological care in Melgaço, Maués and Vitória do Jari.

These UBS attempt to give priority to hinterland families, maintaining less strict timetables and scheduled workdays. Even for ACS work, a combination of small riverside communities occurs, sometimes with significant distances between them, in order to follow a minimum number of families.

At most municipalities, structural conditions of UBS in rural areas do not allow for the same actions offered at the unit at the municipal seat, except for Aveiro and Boa Vista do Ramos, where hinterland UBS had structural conditions superior to that of the municipal seat, with equipment sufficient to address urgent situations. The differences between the UBS at the municipal seat and the hinterland were mostly in the availability of actions (oral health, vaccination, drugs, collection of laboratory exams samples) and in the composition of the teams. Drug dispensation occurs at most UBS, but it is irregular and insufficient, especially at hinterland units. For laboratory tests, biological material is collected at health units at the municipality seat, with diversified strategies between municipalities.

The use of information and communication technology tools (TIC) is incipient. The information system of primary healthcare is established in all municipalities, but most of them work offline, filling out the forms of Simplified Data Collection (CDS) at the UBS and then sending them on for digitalization and transmission to the e-SUS-AB system. UBS are digitalized, but few are connected to the Internet. Electronic medical records were only implemented at UBS, municipality seat and hinterland, at Boa Vista do Ramos and Prainha.

Difficulties regarding the use of Remote Health or Remote Medicine have been reported, even in municipalities with some experience in the use for visitations with specialists (Melgaço) and professional training (Maués). The difficulties were attributed to connectivity and electricity issues and to the limitations of radio transmission, especially in the hinterland.

Text messaging app WhatsApp is very popular among managers, EqSF and users for transmitting diversified information: guidelines on how to provide care for users, sending of production, sending information from electronic medical records.

In the most remote areas, radio transmitter and local radio stations are important means of communication, especially when there is no access to a telephone or to the Internet.

Adaptations of PNAB guidelines to the Amazon reality - multiple organizational formats for primary healthcare

ESF is implemented at RRM, but with adaptations imposed by the characteristics of the fluvial Amazon context. The adjustments made by local management aim mostly to ensure access to primary healthcare in the most remote areas, but not always ensuring the continuity and the integrality of the service.

Table 4 shows how varied and conjugated are the organizational formats of primary healthcare offered. Modalities induced by the federal government coexist with local government initiatives. Some of the modalities of teams and health units that stand out are Community health agent teams (EACS); Riverside ESF teams (EqSFR); Extended EqSFR; Itinerant EqSF; Fluvian UBS; and support points for UBS in the hinterland.

The Mais Médicos Program has proven to be crucial to maintain EqSF complete at RRM. The arrival of physicians of the program at the municipalities led to the expansion of the ESF coverage and made it possible for local management to invest in the hiring of other professionals for primary healthcare. In some cases, the Mais Médicos Program allowed for municipal investment in the hiring of specialized doctors for back-up and more problem-solving capacity in primary care. However, difficulties remain when it comes to keeping EqSF complete in the hinterland, and some areas remain uncovered, with huge challenges for the expansion of primary healthcare access in areas that are hard to reach.

Table 4. Strategies for the organization of Primary Healthcare and access of populations living in hinterland areas, rural remote municipalities of the fluvial Amazon, Brazil, 2019.

Strategies	Boa Vista do Ramos (AM)	Maués (AM)	Aveiro (PA)	Curuá (PA)	Prainha (PA)	Melgaço (PA)	Vitória do Jari (AP)
eSF - Family Health Team*	x	x	x	x	x	x	x
eqSFR - Riverside eSF Teams	x			x			
EACS - Community Health Agent Teams				x	x		
Eq ESF - Quilombola/settlers eSF teams			x				
Teams with physicians of the Mais Médicos/Médicos pelo Brasil Program	x	x	x	x	x	x	x
All users (municipality seat and hinterland) registered at UBS at the municipality seat		x				x	
Users registered at the UBS of their area of residence (municipality seat or hinterland)	x		x	x	x		x
UBS at the municipality seat with specific ESF Teams to provide care for the hinterland population	x	x	x	x		x	
ESF or ESFR Team remains at the UBS at the municipality seat and moves to work at UBS or support points in the hinterlands	x	x		x	x	x	x
ESF Team carries out group effort events or itinerant actions in areas not covered by Family Health Strategy, including without community health agents	x	x	x	x	x	x	x
ESF or ESFR team resides in hinterland areas	x						
ESF or ESFR team spends part of the month in hinterland areas	x		x			x	x
Nurses, nursing technicians or community health services carry out amplified actions	x	x			x	x	
Health professionals (high school or college degree) in 24-hour shift stand-by to ensure healthcare to users in case of urgency	x	x	x	x		x	x
Use of messaging app WhatsApp as means of communication for management and professionals	x	x			x		x
UBS in hinterland areas	x		x		x	x	
Fluvial UBS		x				x	
Support points or UBS with health professional (high school or college degree) residing close to or at the unit	x		x	x	x	x	x
Support points or UBS with means of transportation to take users to health service at the municipality seat in urgent cases	x		x	x		x	
Use of school space as support unit for itinerant health actions or group effort actions			x	x			
Ambulance or ambulance boats carry users to and from the hinterland in urgent and emergency situations, to health services at the municipality seat	x	x	x	x	x	x	
ESF or ESFR team has transportation available for travels in the hinterland areas	x	x		x		x	x
Community health agents working in the hinterlands have rabetas for house calls.	x	x				x	

Source: Database of the research "Primary Healthcare in rural remote territories in Brazil"

It should be pointed out that modalities that aim to favor access in the fluvial context (such as EqSFR and UBSF), financed by the MS, are not often implemented. College-degree professionals

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only remain in riverside areas in municipalities that implemented an EqSFR, a powerful strategy for creating links and longitudinal care. Although financed by the Federal Government, these teams are complemented with municipal resources to maintain infrastructure, lodging for professionals, and food.

Amplified models of EqSFR were identified, with the inclusion of more professionals in addition to the minimum team, and with diversified forms of actuation: EqSFR that travel from the municipality seat to act in a permanent fashion at UBS at riverside locations and EqSFR that work in an itinerant fashion, especially in more remote and isolated areas, with periodical actions and remaining in the communities they visit; systematic actions to follow priority programs (prenatal, child growth and development, hypertension, diabetes) and punctual actions with a campaign nature, such as vaccination and cervix cancer exams. The unavailability of primary healthcare services in areas that are hard to reach results in a predominance of itinerant and punctual health actions for populations residing in more remote locations.

UBSF is considered a powerful resource for providing primary healthcare in riverside areas that are hard to access, including for managers who did not have this resource available at their municipalities. The fluvial unit is provided by the MS with the monthly payment of financial resources, after registration. However, the municipal management plays a significant role in financing the actions and in maintaining the boat. The fixed UBSF team is complemented by EqSF responsible for following populations of hinterland areas, with actions scheduled for an average interval of 45 days, to reach very hard-to-reach populations in an intermittent way. The UBSF encompasses all the actions available at a conventional UBS; however, itinerant actions prevail, without the guarantee of a link with reference EqSF and the continuity of care.

Support points are commonly structured in hinterland areas to carry out health actions with EqSF that travel from seat to seat. These are units that rely on the presence of at least one nursing technician, fixed at the unit, working in stand-by 24/7 for urgent care. Some support points have transportation available to carry users to the health service at the municipality seat, if necessary. The argument for the maintenance of this type of structure is the mitigation of geographical barriers and of the absence of EqSF and make viable suitable access in urgent situations.

Stand-by is a common form of healthcare employed in rural areas, out of the habitual opening hours of the UBS and on weekends. In urgencies, professionals in stand-by (usually a nursing technician or a nurse who resides in the municipality) is called, either by the patient or by the community health agent. Depending on the severity of the case, the user is sent to units at the municipality seat in an ambulance, when available.

All those interviewed were unanimous in considering the community health agents are the professionals present in rural areas. They are often the only representative of the SUS in more remote locations. These agents play a crucial role with the EqSF, having the function of mediator between the team and the community and facilitating access to health services.

Health actions carried out by these agents tend to be differentiated between those who work at the municipality seat and in the hinterland of the municipalities. The distances between the micro areas and the number of people residing in the villages define the number of people and families bound to the community health agents in the hinterland. House calls made by these agents make it possible for users to be followed up in priority programs and for the conditions necessary for the Bolsa Familia Program (PBF) to be monitored.

Inter-sectorial actions developed by the EqSF, when they occur, are articulated with the education sector, fomented by the Health at School Program, using school spaces to promote health actions. Other articulations were mentioned: social welfare with specific programs of the Social Welfare Reference Center (Prainha, Aveiro, Maués, Melgaço, Vitoria do Jari) and of the Environment Secretary (Melgaço and Boa Vista do Ramos).

The availability of transportation for the EqSF has proven to be decisive for providing primary healthcare, especially when it is impossible to maintain fixed services in remote, low-occupation areas. The long distances associated, and the irregularity of local transportation make it harder for users and health professionals to travel between municipality seat, hinterland, and region.

Sanitary transport is managed and mobilized by municipal management, who consider the cost of acquisition and maintenance very high. These resources are often interrupted, such as the UBSF operation, due to the financial unsustainability for municipal governments. Funds from parliamentary amendments were mentioned as

an important source of resources to purchase means of transportation and to refurbish UBS.

Geographical obstacles have motivated the hiring of specialized physicians to work at the municipalities, with the goal of strengthening of primary healthcare response capacity (Melgaço, Maués and Vitoria do Jari).

Challenges for guaranteeing access to primary healthcare

The main challenges for access to primary healthcare at fluvial Amazon RRM are related to financing and offer of primary healthcare services; to the permanent dilemmas for the provisioning and fixation of professionals in hard-to-reach areas; to geographical access; and to the obstacles relative to users and professionals' mobility in order to receive or provide healthcare. Chart 1records meaningful quotes of municipal government managers interviewed who mentioned risks for the sustainability of primary health service in rural remote contexts.

The fundamental challenge for the organization of primary healthcare at the RRM under study refers to the disjunction between health funding and the characteristics of the territory: remote areas, long distances, huge areas with sparse populations; low attractiveness of municipalities due to the insufficiency of infrastructure. These particularities of the Amazon context make challenges even harder for the implementation of primary healthcare, making costs much higher than what was calculated for the funding. Primary healthcare sub funding can generate political unsustainability if there is no interstate execution plan specific for these places.

The potential high coverage of ESF at the municipalities does not express the reality of the areas left uncovered and the need to activate various resources locally to overcome the deficit of access, which are not always successful. The further from the municipality seat, the bigger the challenge of implementing ESF, with the prevalence of punctual health actions without the guarantee of open-door primary healthcare, with regular, continuous, and full care. What stands out are itinerant and first aid actions, faced with the actual difficulty of maintaining physical structures and complete health teams in these scenarios.

The providing of care organized in UBS localized in hinterland areas, with EqSFR teams and regular itinerant actions at the UBSF have proven to be powerful to facilitate suitable access and favor the remaining of college-degree professionals in remote riverside areas. But few municipalities have adopted these formats of registration proposed by the MS. One of the reasons can be attributed to the high costs of maintenance for municipalities and difficulties in attracting professionals.

Sanitary transport gains protagonism in the way the municipal health system is structured. Financial support from the state and federal governments to aid treatment away from one's residence is feeble. In addition to being low, it does not consider regional specificities and the high cost of river transportation. Managers are involved in the availability of transport within the municipality, for urgent and emergency situations and in the region, for access to specialized care. Travel difficulties mobilize local management to ensure some services in the municipality itself, faced with the geographical barrier that hamper regional access. Assistance to low-risk childbirth in small municipalities is an example for this issue.

Discussion

Results show that conditions of access to primary healthcare are potentially shaped by the geographical characteristics of a place and are amplified by the non-inclusion of public policies in distant and rarefied locations. They show how geographical, environmental, economic, and social conditions of fluvial Amazon RRM interfere in the providing of primary healthcare. National studies yield similar result on the Amazon region[15-17] and international studies highlight the effects of infrastructure limitations on access conditions, on the availability and on the quality of healthcare in rural remote areas throughout the world[7,18,19].

It is in this context that health policies are reinvented on a daily basis, so that primary healthcare services are established and make sense in such unique spaces. In the Amazon context, whose socio-spatial dynamics are essentially influenced by natural cycles, it is important to highlight how big the challenge is when it comes to implementing public policies traced on a national level and based on a standard that is alien to this reality[20]. The more remote and less densely populated a location, the more restricted are the organizational options for primary healthcare. In parallel, challenges and the necessary boldness for the development of encompassing and integrated health services increase.

Chart 1. Dimensions, categories of analysis, and "meaningful quotes" of health municipal managers in primary healthcare, Rural remote Municipalities, fluvial Amazon, Brazil, 2020.

Dimensions and categories of analysis	Meaningful quotes - Municipal Health Secretaries and Primary Healthcare Coordinators
Primary healthcare at the municipal SUS	
Coverage and (un)availability of services	"Coverage is 90%. Some of the more distant populations are uncovered. In periods of vaccination, for instance, we will now be having the measles campaign, we go to communities and take the opportunity and bring a physician and a nurse with us, who are here from the municipality seat. [...] Last the time the vaccine went there, they left at 4 in the morning and got to the community almost 9 a.m." (13GM1).
	"In the region of Várzea, Riverside ESF, we have three communities without coverage, and they're big communities. We have four communities in the river region, which makes up seven. In the land region we have two communities not covered, two communities that are covered. Almost ten communities where the population has no health agent assistance." (13GM2)
	"The units should be closer, but we have a problem in our region, which is distances. I can't put a UBS in each community, I'm not going to have 114 UBS and I can't maintain 114 units, so our big problem is territorial dispersion." (12GM2)
Adaptations of the PNAB guidelines to the Amazon reality: multiple and synchronous formats of primary healthcare organization	"We have a full team there, with doctor, dentist, nurse, where they work according to the riverside population, but with some differences. Because after all our Amazon region is different from the rest of the country. You cannot take everything of the decision at face level. Sometimes you need to make an organizational arrangement there to see if things actually flow any better." (16GM2)
	"We end up adapting the working of the unit to help these people who arrive from riverside areas, from rural areas. So much so that we set aside forms for them, we usually reserve four spots for professionals to visit these people from rural areas, more urgent cases. So we make this difference so they are visited and if they come at that time and there is no way we can find a place for them in the morning, I leave them scheduled for the afternoon." (16GM1)
	"If the technician has a doubt, something he can sometimes solve it there, he calls us and we guide him - no, wait a little longer", or "do this, wait another couple of hours, ok? Now, when it is childbirth, or a big cut, or an accident, something like that, or a stroke, or a heart attack, anything, then he will not even contact us. He sends the patient straight on and only then he calls us to say there is a patient with this and that coming our way, so we can prepare support to receive the patient. (14GM2)
	"Since we do not have health units in the rural area, how do I work with them [EqSF]? I work in an itinerant fashion, so once a month these teams, each in its region, each team covers a territory. They take a boat, it is a doctor, two nurses and nursing technicians, so they stop at each community and cover the whole area, so two teams work in a boat in an itinerant way the entire month, the rest of the days when they are not in the area, they are working here at the Basic Unit, here in the urban area, visiting these people who come from the rural areas. Until we can build the health unit for those regions and manage to transfer those teams there for good." (16GM1)
	"The fluvial UBS is a special thing that came to [state], which actually changes the issue of riverside populations in the hinterlands. It's something that really changes people's lives." (17GM1)
	"We don't take just one [vaccine] to the [UBSF], we take all of them. So we also take anti-rabies for public health surveillance to apply to cats and dogs, when we pass by we vaccinate them too. Then there is the capture guys [bats]; Social Welfare goes with the Bolsa Familia thing for registration, updating. We also help them with weighing, height measuring, vaccination. There's also the whole esthetic part that also goes, there's the notary people who go to make their documents." (14GM2)
	"The community health agent is in charge of health guidance, promotion and prevention. For us at the Secretary's Office, they are our eyes in the community, because we are very far from their reality, they are there, they actually get to see the community, and it is through the health agent that information gets to users, vaccination day, doctor's day, PCCU offer day, the day their prenatal exams are scheduled, they do the scheduling." (12GM2)
	"The role of community health agents is to do house calls [...], he's the maximum health authority in a community, so if someone's sick, he hopes the health agent will medicate him, he waits that access comes through him [...] I always tell them a well-oriented population gets ill very rarely." (16GM1)
	"[...] in the rural area we reduce this number because the territorial expression to carry out visits is larger. Sometimes riverside people are not just in villages, they are alone in that place, then to get to the next house it is another I do not know how many minutes by rabeta, they use the rabeta a lot. Each community health agent has his own rabeta. [...] The rabeta and the fuel are provided by the municipal government, but we don't get any resources for this from the state government, nor from the federal government." (14GM2)

it continues

Chart 1. Dimensions, categories of analysis, and "meaningful quotes" of health municipal managers in primary healthcare, Rural remote Municipalities, fluvial Amazon, Brazil, 2020.

Dimensions and categories of analysis	Meaningful quotes - Municipal Health Secretaries and Primary Healthcare Coordinators
Challenges for guaranteeing access to primary healthcare	
Financing and offer of services of primary healthcare	"The first of them [challenges] is the sub funding of the health sector. [...] and all those issues I mentioned during the interview: professionals' commitment to primary healthcare, geographical barriers. It [sub funding] prevents us from working the way we would like to. [...] No matter how much the municipal government does, it is still not enough. [...] So the financial part, it says a lot about how health will behave." (16GM2)
	"We have the financial issue that we'd like to do much more, but we're stuck. The logistics in our municipality is very complicated, [...] assembling a vaccination campaign requires a lot of money. To get there you need a voadeira, a boat, nobody is going to vaccinate and back. The team spends five to seven days there. For colonies, you need a car or a motorbike, and then you spend money on ice, food, daily fees for employees who need to be paid, [...] (13GM2)
	"I just got back from a fluvial UBS trip of 16 days. 30,000 reais of fuel for 16 days of travel. I receive 90,000 from the Ministry of Health. On those 16 days I spent 120,000 in drugs and consumables, plus professionals, more than 10,000 in food and cleaning material. This trip cost me about 200,000 reais." (17GM1)
	"They bought the ambulances, delivered the ambulances and they're working just fine. Then the fuel and the person driving the ambulance, the municipal government pays for those. He managed the amendment to buy them only, right, so the municipal government maintains them. We noticed a big improvement." (14GM2)
	"The mother of health is our UBSF. Professionals of our own region drew the plant, with everything we needed to help the entire riverside population [...] until the Federal Government came and [municipality] was one of those contemplated. [...] Almost all the money [sent by the Ministry of Health] goes on drugs and professionals." (14GM2)
Provisionment and fixation of professionals	"[...] now what would really make things move on would be the enabling of the fluvial UBS or the enabling of these strategies in the rural areas. It is just that we also think it is not feasible to enable rural area strategies because resources are too low to keep professionals there and also for us to find physicians, nurses who want to live, to reside in the rural areas, especially those that are so hard to reach. It's very complicated." (14GM2)
	"It also ended up taking a financial burden off the shoulders of the municipal government. Because now instead of paying 15 or 16 thousand, I am paying R$ 2,500. The rest is paid by the Ministry of Health. When the doctor knows that his salary is paid by the Ministry of Health, they work without the fear of not being paid. This makes it more attractive for them to come to the municipality. But I think this program has come to improve things a lot. Today we say that primary healthcare is not possible without Mais Médicos." (17GM1)
Geographical Access and mobility for healthcare	"Our greatest difficulty at [municipality] is the issue of childbirth, and one of our fights is that we want a mixed unit to be structured for natural birth, but then you'd need equipment, a professional on call, because these transfers usually happen at night [...] They [the population] question this situation a lot. [...] Unfortunately, due to this delay and to the condition of the road, some babies ended up dying. This is why the biggest fight of [municipality] is to improve this service at the mixed unit [...]." (18GM1)
	"We have the financial issue that we'd like to do much more, but we're stuck. The logistics in our municipality is very complicated, [...] assembling a vaccination campaign requires a lot of money. To get there you need a voadeira, a boat, nobody is going to vaccinate and back. The team spends five to seven days there. For colonies, you need a car or a motorbike, and then you spend money on ice, food, daily fees for employees who need to be paid, [...] (13GM2)
	So is there an ambulance at the UBS? A: The ambulance did not work very well at the community [rural 1] because of the road. It would get bogged down, break down, it was not sturdy enough. To get there you need sturdy pick-ups. We have had cases of going to pick up a patient and the ambulance got bogged down, another car had to go there from here to help it. (15GM2)

Source: Database of the research "Primary Healthcare in rural remote territories in Brazil"

The Australian experience shows the importance of defining organizational models for rural and remote areas, usually communities too small to absorb standardized formats of primary healthcare providing. In these contexts, sustainable operational models involve measures that consider scale diseconomies resulting from great distances, dispersed and rarefied populations[21].

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Primary healthcare is established at RRM, with a municipal execution densely supported by financial support provided by the federal government between 2010 and 2016[22]. However, policies in force were not sufficient to shape primary healthcare organization to local needs, and access failures have remained in more distant, rarefied areas.

In addition, sub funding produces effective barriers to primary healthcare providing, as inadequate service limits access to healthcare, postpone use in moments of need, and have a negative effect on health results[23].

Although access is guaranteed to hinterland users for municipality seat UBS, with priority scheduling for their visits and walk-in visits, without opening time restrictions, these measures may cover up unacceptable barriers to access to primary healthcare[24].

Provisioning and fixating of professionals is a big challenge in fluvial RRM. Adhesion to MMR has widened the coverage of ESF with complete teams, a milestone for the strengthening of primary healthcare in these places[25]. However, provisioning for workforce, especially doctors, in more remote areas continues to be a problem without a solution. Hiring doctors through the municipal government has proven to be unsustainable due to the high salaries required to attract professionals, which does not even guarantee they will remain there, and RRM instability is a serious threat to the guarantee of SUS access.

Scarce workforce is perhaps the most common challenge among the different rural remote contexts and the responses to overcome this obstacle seem to go beyond provisioning. It requires strengthening of multiprofessional, shared and highly qualified work to act in such unique environments[1,5,25-27] It requires strategies based on information and communication technology tools, remote solutions that can expand resources and promote suitable, resolutive and high-quality care in areas of difficult access[21,28].

The unavailability of transportation exemplifies the urgency of systemic responses to overcome barriers to the use of health services, as they are a defining resource for access at RRM. The difficulties and costs related to transportation affect users who need to travel to the municipality seat to use primary healthcare services and limits the capacity of action of EqSF that need to travel to the hinterland. In both directions, difficulties are related to distances, precariousness, low regularity, informality, and the high cost of transportation, in particular fluvial and airborne.

Challenges are huge to carry out public policies formulated based on an urban standard of cities that does not come close to reaching the specificities of rural remote spaces. Providing primary healthcare in fluvial RRM reflects complex, multifaceted interactions. It involves strategic and sustainable measures: governance finely tuned with resources and actions of multiple sectors and government agents; national support policies with viability for execution on a local level; community engagement to identify necessities in health and for the planning of actions of health services[26,27,29,30].

Final considerations

The results presented in this study reveal challenges to municipal management that demand pressing responses, so as to not violate the basic principles of rights to health and universal access to SUS. The characteristics of RRM marked by rivers demand other forms of primary healthcare organization, supported by community values and cultural competences, crucial elements for the development of health actions in such unique places. It is necessary to build sustainable ways to implement robust primary healthcare in the SUS, based on the offer of continuous, longitudinal care, with guaranteed access to quality services. The first steps have been taken, but primary healthcare sustainability is not guaranteed, as is not the overcoming of access barriers. In remote, rarefied contexts that depend on fluvial transportation, challenges place for the providing of SUS health services are higher. The fight against these circumstances go beyond the capacity of local management and of the health sector, involving amplified systemic and political changes in social and socio-environmental protection.

Collaborations

MCR Fausto and L Giovanella contributed to the conception, analysis, interpretation of data,writing and final review of the article. JG Lima, LMS Cabral, and H Seidl contributed to the writing and final review of the article.

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