

Health Service Research

Variation in primary health care services after implementation of quality improvement policy in Brazil

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Abstract

Background: Brazil is the most populous country with a public, universal and free health care system. The National Program for Access and Quality Improvement in Primary Care (PMAQ) was created to improve the quality of primary health care (PHC).

Objective: To evaluate whether progress generally has been made within Brazil's PHC since PMAQ implementation, and if changes occurred uniformly in the country, while also identifying municipal characteristics that may have influenced the improvement.

Methods: This is an observational study using data from PMAQ external evaluation (2012 and 2014), a 1200-item survey used to evaluate Brazilian PHC quality. After confirming the groupings of items using factor analysis, we created 23 composed indexes (CIs) related to infrastructure and work process.

Results: On average, the large majority of CIs showed improvements between 2012 and 2014. Region and city size moderated changes in the PHC indices differently. Overall, there were better improvements in infrastructure in the Northeast compared with other country regions, and in smaller cities (10 000–20 000 people). Infrastructure indices appear to have improved equitably across the country. Work process improvements varied with city size and region.

Conclusion: Despite similar support of PMAQ across the country, improvements are not predictable nor homogeneous. Non-uniform improvements were seen in Brazil's PHC. Though we do not directly evaluate the effectiveness of the PMAQ (financial reward) method, these initial findings suggest that it is a potentially useful tool to improve health systems, but additional support may be needed in regions that lag behind in quality improvements.

Key words. Family health, health systems, pay-for-performance, primary care, public health, quality of care

Key Messages

- Policies based on financial reward are useful tools to improve health systems.
- Quality improvements were observed in most realms with PMAQ policy.
- City size and location may mediate policy implementation and its results.

Introduction

Brazil is the most populous country in the world with a public, universal and entirely free health care system. The Brazilian Unified Health System (SUS), created in 1988 with the principles of universality, equity and integrated care, provides primary, secondary and tertiary health care (1). In 2004, the SUS established a primary health care (PHC) strategy at the municipality (a city or town with its own local government) level, entitled *Estratégia Saúde da Família* (Family Health Strategy; FHS). This strategy is run by the municipalities and provides a broad range of PHC services delivered by a multidisciplinary team composed of a physician, a nurse, a dentist, a nursing assistant, a dental assistant and community health workers (2). Each team is responsible for the health of the population living in an assigned geographical area, comprising ~1000 families (4000 people) (3). The Family Health Team (FHT) professionals work under the aegis of PHC principles; providing basic health care, promoting health activities and preventing diseases, as well as referring those in need to other levels of care (e.g. secondary and tertiary health care). In 2017 ~40 000 FHTs covered 5398 of the 5565 municipalities in Brazil, providing care for roughly 63.2% of the Brazilian population (4). Brazil is internationally recognized for its development of PHC at the local level (5), where the municipalities are responsible for the implementation of the PHC.

Historically, the FHS has struggled with access, quality and service coordination (6–8). Over the past decade, several initiatives have been designed to improve PHC quality in Brazil, such as the evaluation for quality improvement (AMQ), and the FHS improvement project (PROESF) (9). These programs have not provided the anticipated improvements, however.

Most recently, a national program was initiated to systematically evaluate structure, process and outcomes for improving PHC access and quality (*Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica*, PMAQ) (10,11). In 2012, most of Brazil's municipalities participated in the PMAQ program ($n = 3965$; 71.2%), increasing to 91% in 2014 ($n = 507$). The PMAQ process is based on the establishment of a continuous cycle of improvement of access and quality, divided into four stages: contracting, development, external evaluation and re-contracting (12). After contracting, municipalities receive, from the federal government, 20% more financial support than normally, which is intended to be used during the development stage. In the development stage, the municipalities provide training, planning support and other forms of FHT improvement methodologies, according to the teams' needs/reality. Towards the end of the developmental stage, an external evaluation is performed and its information used to assess FHT quality. Upon re-contracting (2 years later), this financial aid is reassessed and the municipalities receive more or less funding depending on how their FHTs performed, with more funding going to those with better performance.

Brazil is divided in five regions (North, Northeast, South, Southeast and Midwest). The North region is where the Amazon forest is located and is the largest region of the country, with the lowest population density, and few paved highways (almost

isolated from the rest of the country). The Northeast region, together with the North region, has the lowest levels of social indicators, being considered the most impoverished region. The Midwest region has a low population density, where most of the land is used for ranching. The region is the least industrialized, based mainly in food and meat processing. The Southeast region (where Rio de Janeiro and São Paulo are located) is the most industrialized and populous region, known as the wealthier region. The South region is historically characterized by its high standard of living, with considerably better social indicators. The South includes some of the cities with the highest Human Development Index as it was most recently (19th century) populated by European immigrants.

Evaluation of the quality of health care programs is exceptionally complex. Yet, are countries and international agencies are recognizing high quality health care as a cornerstone of socioeconomic progress, an increasing number of tools are being developed to measure the impact and effectiveness of health care quality.

The objective of this study was to use data from the external evaluations to conduct a comprehensive comparison of the quality of the municipalities' PHC system at two time points (2012 and 2014). The article examines whether changes have occurred over the course of the 2-year period in PHC infrastructure and health teams work process, and it examines if these changes are happening uniformly across Brazil or if they differ by region or city size.

Methods

Data

Data from the first (2012) and second (2014) PMAQ external evaluation were used in this study. Data collection for FHS in the PMAQ is performed using three instruments/questionnaires/modules: one regarding infrastructure (infrastructure variables were directly observed), one related to work process (work process questions were asked to an FHS team member) and one regarding user satisfaction (questions regarding user satisfaction with FHS). In this study, only modules one and two (infrastructure and work process) were used. The questionnaire consisted of ~450 questions on infrastructure and 750 questions on work processes.

In the first evaluation, a total of 3965 (71.2%) municipalities, including 17 482 FHTs (53.1% of FHTs established by 2012), participated. For the second evaluation, 5070 (91.0%) municipalities, including 30 522 FHTs (88.7% of FHTs established by 2014), participated. There are more infrastructure observations than work processes observations because in 2012, the Health Ministry was particularly interested in infrastructure, so this module was completed in all primary health units, even in those not participating in the PMAQ. We only use data from municipalities with data in both time points: 3767 (67.6%) municipalities and 23 022 FHT (66.9% of FHT in 2014) for infrastructure and 15 670 FHT (47.60% of FHT in 2012 and 45.54% in 2014) for work process. Because some FHT did not answer all the questions, the number of FHT varies by outcome and year of evaluation.

Creation of indexes

Similar variables included in both 2012 and 2014 were identified. With the exception of items with >5000 missing observations per survey year, items were grouped into 20 groups (10 for infrastructure and 10 for work process) based on FHS guidelines (2,3) and PMAQ evaluation themes (12). A series of tests validated these recommended groupings: pair correlation, Cronbach's alpha and factor analysis. Then each item was scaled from 0 to 1 (1 = most positive outcome) and the items within a group averaged to form the composed index (CI). In addition, averaging all the CIs within the overall category created three overall CI variables, two for Infrastructure and one for work processes. Table 1 describes the CIs created.

Statistical analysis

Because the level of evaluation is the FHT but the level of analysis is the municipality, the municipal level CI was created by averaging of all FHT scores. Depending on city size, the number of FHTs within municipalities varied from very few (<5) to >200. We tested if each CI at the two time points were statistically different using *t*-test, one-way analysis of variance (ANOVA) and T² test (Hotelling). ANOVA and generalized estimated equation were used to compare the CIs in the different regions and municipalities' sizes.

In addition, a differenced CI variable (CIs) was created for each municipality as the result of the 2014 CI value minus 2012 CI value. These were then regressed based on their region and city magnitude. The percentage change was also calculated.

Stratification variables

We repeat the statistical analysis using two stratification variables: city size (population) and country regions.

City magnitudes were categorized according to their population size, based on the *Brazilian Institute of Geography and Statistics* (IBGE) guidelines: Level 1 (0–5000), Level 2 (5001–10 000), Level 3 (10 001–20 000), Level 4 (20 001–50 000), Level 5 (50 001–100 000), Level 6 (100 001–500 000) and Level 7 (500 001–maximum) (13). We hypothesize differences in quality improvements by city size because municipal challenges and management capacities differ based on city size.

Brazil is divided in five regions. We hypothesized that quality improvements may differ in the different regions of the country (North, Northeast, South, Southeast and Midwest) because of the intrinsic difference among the regions.

Results

Most (18 of 20) of the quality indicators (CIs) were significantly different across the two time points, with an increase over time (Fig. 1), where only two CIs did not significantly change: medications offered (MEDICATION) and vaccine offered (VACCINE).

When observing changes by city size, 16 of 20 CIs showed significant variation by city size (Fig. 2, Table 2). Health facility identification (UNITIDENTIFICATION), diagnostic test offered (DIAGNOSTICTESTS), professional link to the service (LINKTOSERVICE) and home visit and social participation (HOMEVISIT) did not significantly change.

The largest increases in quality happened in municipalities with a population of 10001–20000, and in most cases, larger increases happened in instances of the lowest CI scores in 2012 (e.g. services offered [SERVICESOFFERED], overall infrastructure quality [INFRASTRUCTUREQUALITY], diagnostic test offered [DIAGNOSTICTESTS], vaccines offered [VACCINE], health

attention equipment [HEALTHATTENTIONEQUIP], medical equipment [MEDICALEQUIP], space adequacy [SPACEADEQUACY]). In contrast, the medication CI (MEDICATION) increased most where the municipalities already had the highest value in 2012.

When observing the work process CI variables, different city size populations were associated with higher percent of change. Municipality support for family health strategy (CITYSUPPORT) and family health strategy planning activities (PLANNING) presented higher percent change in municipalities sized 0–10 000, whereas child attention (CHILDATTENTION), prenatal care (PRENATAL) and the overall work process quality (WORKPROCESSQUALY) in cities sized 10 001–20 000, and patient welcome into the health unit (PATIENTWELCOME), health promotion activities (HEALTHPROMOTION) and school health activities (SCHOOLHEALTH) in municipalities 50 001–100 000.

When observing the changes by region, the biggest increase occurred in the Northeast region variables (Table 3), and in most of those cases, the Northeast is the region with the worst baseline values. Therefore, the improvement seems to be happening where needed the most. When looking into the work process CI variables, the Northeast region presented an increase in four CI variables, whereas the North and Midwest showed increases in two CI variables and Southeast in one.

When observing the CI values for different regions and city size, the variables present improvements in average municipality FHT quality over time (2012 and 2014 period), affecting the quality outcome of PHC (Tables 2 and 3). Figure 1 displays the variables percentage (%) of change by region and city size.

Discussion

In this study, we found that PHC quality, measured by work process and infrastructure CI variables, improved between 2012 and 2014 in Brazil. Infrastructure quality progress occurred in an equitable manner, with the largest improvements among those with the lowest initial quality. Improvements (work process and infrastructure) were not consistent; however, in that there was substantial variation by city size and country region/location, which may indicate these factors are mediators. Though the PMAQ, a Brazilian financial reward program to improve PHC, is a national program, municipalities manage PHC. Thus, it could be expected that national public policies have differing impact, where city size and location variables mediate the implementation and or the results of the policy. These factors are important when planning national policies administered at a local level.

This is the first study to evaluate PHC quality using PMAQ validated CI variables data. Composite variables are measurements based on multiple data items (14), allowing for examination of improvements in a wide range of areas. However, there are some limitations to the study. Only PHC teams that offered to be evaluated were included in PMAQ and in this study. Nevertheless, the number of FHTs evaluated and their distribution in the country (>50% of the PHC teams located in >70% of municipalities) suggests that these improvements are representative of a large portion of the country. The attributes of a high-performing PHC system are well documented in the literature, including access, continuity, team-based care that is comprehensive and whole-person centred, creation of population-focused accountability, coordination and service integration and patient engagement (15). These attributes were not directly evaluated in this study, as the data did not allow for direct inference on them.

The understanding of mediating variables and their underlined influence on implemented policies is essential for planning (should

Table 1. List of variables that constituted each composed index (CI) created based on PMAQ 2012 and PMAQ 2014 external evaluation questions

Composed index name	No. of questions	Question descriptive
MEDICATION (medications offered)	47	Complete list of 47 medications
DIAGNOSTICTESTS (diagnostic tests)	4	Plasmodium (thick smear) test; rapid HIV test; rapid pregnancy tests; rapid test for syphilis
VACCINE (vaccine offered)	12	Oral rotavirus vaccine; tetravalent (2012) then pentavalent (2014) shot; diphtheria, tetanus and pertussis shot; MMR shot; pneumococcal 10; pneumococcal (salk)/polio vaccine; pneumococcal 23-valent shot; meningococcal C shot; hepatitis B shot; seasonal flu shot; tetanus/dT shot; BCG vaccine (for TB)
HEALTHATTENTIONEQUIP (health attention equipment)	17	Vaccination cards; pregnancy cards/booklets; child health cards /booklets; sufficient tongue depressor; needles of various sizes; bandages; coolers for vaccines; measuring tape/instrument; disposable speculum; serum catheter macrogotas and microdroplets; endocervical brush; spatula ayres; micropore tape and other; pap smear fixer de lamina; gauze; glass slides with frosted sides; blade holder or plastic jar with lid for slide; strips measuring reagent capillary blood glucose; disposable syringes of various sizes; disposable syringes with attached needles; hard containers for disposal of needles
MEDICALEQUIP (medical equipment)	21	Adult blood pressure device; child blood pressure device; nebulizing device; 200-kg anthropometric scale; child weight scale; anthropometric ruler; adult stethoscope; child stethoscope; light for gynaecological exams; vaccine refrigerator; exclusive pharmacy refrigerator; glucometer; gynaecological exam with stirrups; clinical exam; ophthalmoscope; sonar; clinical thermometer; otoscope; monofilament kit for sensitivity testing (aesthesiometer); clinical light; thermometer with extension cord
INFORMATICEQUIP (informatic equipment)	10	At least one working computer; at least one working webcam; at least one set of working computer speakers; at least one stabilizer in working condition; at least one microphone in working condition; at least one printer in working condition; at least one TV in working condition; Health unit internet?; Tele-health available to tea; dedicated room for internet use
SPACEADEQUACY (space adequacy)	17	Any patient bathroom (male or female); Health bathroom for workers; waiting room/waiting área; vaccination room; doctor's office; dentist's office; inhalation room; room for medical procedures; wound dressing room; observation room; sterilization room; room for public health activities; environment has good ventilation and air conditioning; well-lighted environment; washable floors and walls of service unit; good acoustics in health unit; patient privacy in health offices
SERVICESOFFERED (services offered)	9	A car (for home visit and other errant); car meets the needs of the team; medical consultations; nurse consultation; dental consultation; dispensing drugs by the pharmacy; vaccination; <i>Acolhimento</i> / Welcome/admission/ears; Outro(s)/Others
FACILITYACCESS (access to facility)	4	Corridors are adapted for wheelchair access; all external entrances and internal doors sized for wheelchair access; wheelchair available for patients; Yes/No Water Closet (Bathroom) for disabled people
UNITIDENTIFICATION (facility identification)	14	Adequate signage; the opening hours of the health unit according to ministry of health recommendations; scope of activities offered by health team posted; names and working hours posted; participating in the 'Health Closer to You—Access and Quality (PMAQ)'; telephone number of ministry of health?; professionals in health unit wear ID badges; The team did not disclose its actions to users; clinic open in morning?; clinic open in afternoon?; clinic open in evening?; the health unit is open every day of the week (Monday–Friday); offers service on weekends; health unit open during lunch hours?
INFRASTRUCTUREQUALITY (overall quality of infrastructure)	10	UNITIDENTIFICATION; FACILITYACCESS; SERVICESOFFERED; SPACEADEQUACY; INFORMATICEQUIP; MEDICALEQUIP; HEALTHATTENTIONEQUIP; VACCINE; DIAGNOSTICTESTS; MEDICATION
INFRASTRUCTUREQUALITY2 (overall quality of infrastructure without MEDICALEQUIP)	9	UNITIDENTIFICATION; FACILITYACCESS; SERVICESOFFERED; SPACEADEQUACY; INFORMATICEQUIP; HEALTHATTENTIONEQUIP; VACCINE; DIAGNOSTICTESTS; MEDICATION
LINKTOSERVICE (professional link to the service)	6	How are you hired/directly by the municipality?; stability on work job/hiring bond?; How did you get this job?; Do you have a work carrier plan?; Do you get financial incentive, gratification for performance?; The health team participates on continuing education initiatives organized by the municipality?
PLANNING (family health strategy planning activities)	10	Has the health team planned its activities monthly?; Does the health team do monitoring and analysis of health indicators and information?; A self-evaluation process was carried out in the last 6 months?; Does the team has reunions/meet frequently?; Is there a definition on health team coverage area?; The health team has maps with its region/territory?; The records utilized by the health team are organized by family?; Is there a standard template for the fulfilment of the cover page of individuals medical records?; Is there an electronic record implemented by the health team?; The team considers the user's view to the reorganization and qualification of the labour process?
CITYSUPPORT (municipality support for family health strategy activities)	5	The health team receives support/help for planning and for work organization process?; The municipality offers the health team information that help them to analyse the health situation of the population; Does the team gets help/support for data and health system monitoring discussion?; Do your team receives permanent institutional support (from a person or a team) from the municipality to discuss about the work process/helping in the identified issues/problems?; The health team receives aid from other professionals to auxiliare and/or support solving complex cases?

Table 1. Continued

Composed index name	No. of questions	Question descriptive
PATIENTWELCOME (Acolhimento/patient welcome in the family health strategy)	7	The team performs 'acolhimento' to spontaneous demand in the health unit?; The team provides service for patient removal/transfer/take to hospital, when necessary?; Does the agenda of the health team is organized to—educational health groups; The team conducts prescription refills for users on continued care/programs such as hypertension and diabetes without the need for marking medical appointments?; There is reserve places on the agenda or easy access to professional schedule so patients can search and present/discuss test results?; There reserve places on the agenda or easy access to professional schedule so the patients can remedy post-consultation questions or show how their health situation involved?; The team performs referral of patients complaining of visual acuity or refractive assessment of demand, without the need for consultation appointment?
EXAMS (health attention)	11	For which groups does the team offers action—pregnant women; For which groups does the team offers action—children; For which groups does the team offers action—diabetes mellitus; Which exams are performed in the health unit—creatinine; Which exams are performed in the health unit—lipid profile; Which exams are performed in the health unit—electrocardiogram; Which exams are performed in the health unit—glycosylated haemoglobin; Which exams are performed in the health unit—smear microscopy for tuberculosis; Which exams are performed in the health unit—chest X-ray (tuberculosis); Which exams are performed in the health unit—smear for leprosy; Which exams are performed in the health unit—mammography
PRENATAL (prenatal care)	14	Which exams are performed in the health network for prenatal care—fasting glucose; Which exams are performed in the health network for prenatal care—syphilis serology [Venereal Disease Research Laboratory (syphilis test)]; Which exams are performed in the health network for prenatal care—HIV serology; Which exams are performed in the health network for prenatal care—serology for hepatitis B; Which exams are performed in the health network for prenatal care—urine culture or urinalysis; The team feeds monthly the prenatal care information system?; The team uses the card or the information book to monitor pregnant women?; For the pregnancy monitoring, is there information regarding—the professional responsible for the monitoring of pregnant women?; For the pregnancy monitoring, is there information regarding—dental consultation for pregnant women; For the pregnancy monitoring, is there information regarding—pregnant women vaccination status; For the pregnancy monitoring, is there information regarding—collection of pap test performed during pregnancy; Does the team informs pregnant women regarding tetanus vaccination?; The team gets the results of pregnant women examinations in time for the necessary interventions?; The application of benzathine penicillin G is performed at the facility?
CHILDATTENTION (child attention)	9	The team conducts childcare query (puericultura) in children under 2 years?; Uses the child's health booklet for monitoring the growth and development?; It has a 'copy/mirror' of child health books(information), or other form with equivalent information in the unit?; During follow up of children in the region/area there is—children vaccination; During follow up of children in the region/area there is—growth and development; During follow up of children in the region/area there is—nutritional status; During follow up of children in the region/area there is—newborn screening; During follow up of children in the region/area there is—family violence; During follow up of children in the region/area there is—accidents
—HEALTHPROMOTION (health promotion activities)	12	The team offers educational activities and/or health promotion activities directed to—women (cervical and breast cancer); The team offers educational activities and/or health promotion activities directed to—family planning; The team offers educational activities and/or health promotion activities directed to—pregnant and postpartum women (breast-feeding); The team offers educational activities and/or health promotion activities directed to—men; The team offers educational activities and/or health promotion activities directed to—elders; The team offers educational activities and/or health promotion activities directed to—health nutrition; Conduct educational strategies related to sexual and reproductive health; Conduct focus groups to guide on communicable diseases (dengue, tuberculosis, leprosy, HIV, trachoma), as required by the people in the territory; The use and abuse and dependence resulting from the use of crack, alcohol and other drugs; The use, abuse and dependence on anxiolytics and benzodiazepines; The team incentives and develops in the health unit or territory/area—corporal practices; The team incentives and develops in the health unit or territory/area—physical activity
—HOMEVISIT (home visit and social participation)	9	The team has protocol or criteria for home visits?; The families of the primary care team catchment area visited in distinct frequency according to risk and vulnerability assessments?; Community health workers have the schedule of the visits depending on the priorities of the entire team?; The team has survey/mapping of the assigned users who need to receive care at home (except bedridden)?; The team has record number of bedridden/domiciled by the people in the territory/area?; During home care, the family health professionals do—clinical care(elders or in need of home care); During home care, the family health professionals do—performing nursing procedures; The team offers communication channels that allow users to express their demands, complaints and or suggestions in primary care?; Is there local health council or other spaces of popular participation? Social control

Table 1. Continued

Composed index name	No. of questions	Question descriptive
SCHOOLHLTH (school health activities)	15	The team performs activities in the school?; Which clinical activities is performed by the team—update the immunization schedule; Which clinical activities is performed by the team—early detection of hypertension; Which clinical activities are performed by the team—neglected health disorders detection; Which clinical activities is performed by the team—ophthalmologic evaluation; Which clinical activities is performed by the team—hearing evaluation; Which clinical activities is performed by the team—nutritional evaluation; Which clinical activities is performed by the team—oral health evaluation; Which health promotion and prevention activities—food safety actions and promoting healthy eating (educational activities on the promotion of nutritional and healthy lifestyles; Which health promotion and prevention activities—promotion of corporal practices and physical activity in schools; Which health promotion and prevention activities—education for sexual health, reproductive health and STD/AIDS; Which health promotion and prevention activities—Actions to prevent the use of alcohol, tobacco and other drugs; Which health promotion and prevention activities—training activities for education professionals/teachers to work with health education; Which health promotion and prevention activities—debate/discussion with school teachers; Which health promotion and prevention activities—does not carry out actions of promotion and prevention
WORKPROCESSQUALY (overall work process quality)	10	LINKTOSERVICE; PLANNING; CITYSUPPORT; PATIENTWELCOME; EXAMS; PRENATAL; CHILDTENTION; HEALTHPROMOTION; SCHOOLHEALTH; HOMEVISIT

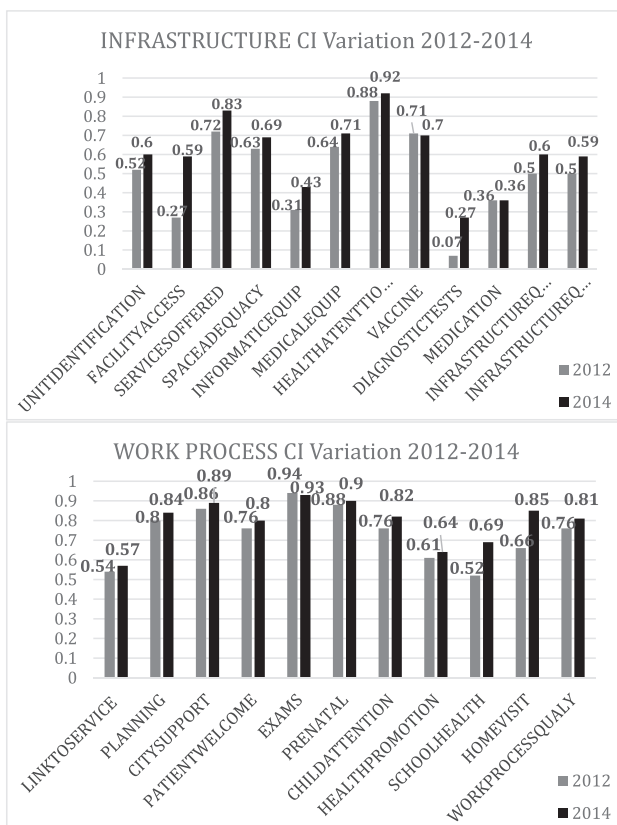


Figure 1. Bar chart presenting the comparison of composed index variables in evaluated years (2012 and 2014).

consider these implications) and longitudinal adjustments. The manner that the mediating variables act may be positive or negative, inducing more equitable policies or increase the disparities. Our study suggests that these mediating variables need to be considered in the health system. This conclusion is supported by other studies, in economics and educations, which have also shown effectiveness differences among the different regions of the country (16,17). According to authors, educational inequalities refer to broader

regional inequalities (18,19). Intra and interregional differences in health care may occur due to several reasons, such as economic, cultural, educational, population composition, organizational, infrastructural reasons, as is the case in education and economic policy.

Equity on PHC improvements

Interesting to note that higher improvements in the CI variables were noticed in smaller municipalities (up to 20 000 habitants), where the CI values were lower in 2012. The variables related to infrastructure seem to have improved in an equitable manner. Principals of fairness and justice behind the Brazilian health and health care systems (20,21) indicate those in greater need receive greater benefits. The Brazilian PHC is ruled by the federal government, but implemented by the municipalities. In a similar manner, PMAQ is designed at the federal level, but the implementation of the financial aid occurs at the municipality level. Through the process of formulation and implementation, public policy involves a chain of actors (institutions and individuals) that transform, adapt, interpret and create new rules that will transform the centrally defined policies. These various transformations, in addition to the idea of errors and vested interests of the players, are a result of the process itself that connects the policy formulation to its implementation (22) and may have modulated the implementation of PMAQ and PHC in a more equitable way.

The fact that the infrastructure CI variables are improving more where the need is higher and where the quality values in 2012 were lower, is a very interesting finding, and may be based on policies implemented over the years.

Policies influence on PHC quality

We have identified an overall increase in infrastructure and work process quality in Brazil's PHC. Although we cannot affirm that this is solely due to PMAQ, it is quite plausible that at least part of this change is related to it. There were other possible impacts, such as the strong economy in that period (23), and the Basic Health Units Redevelopment Program (UBS Requalifica). The UBS Requalifica (2011) used the results of PMAQ to decide where the aid should go, aiming to create financial incentives for renovation, expansion and construction of PHC units, providing suitable conditions for work in health (24–26). This program, distinct from PMAQ, awarded support to municipalities in the most need. It is known that institutional

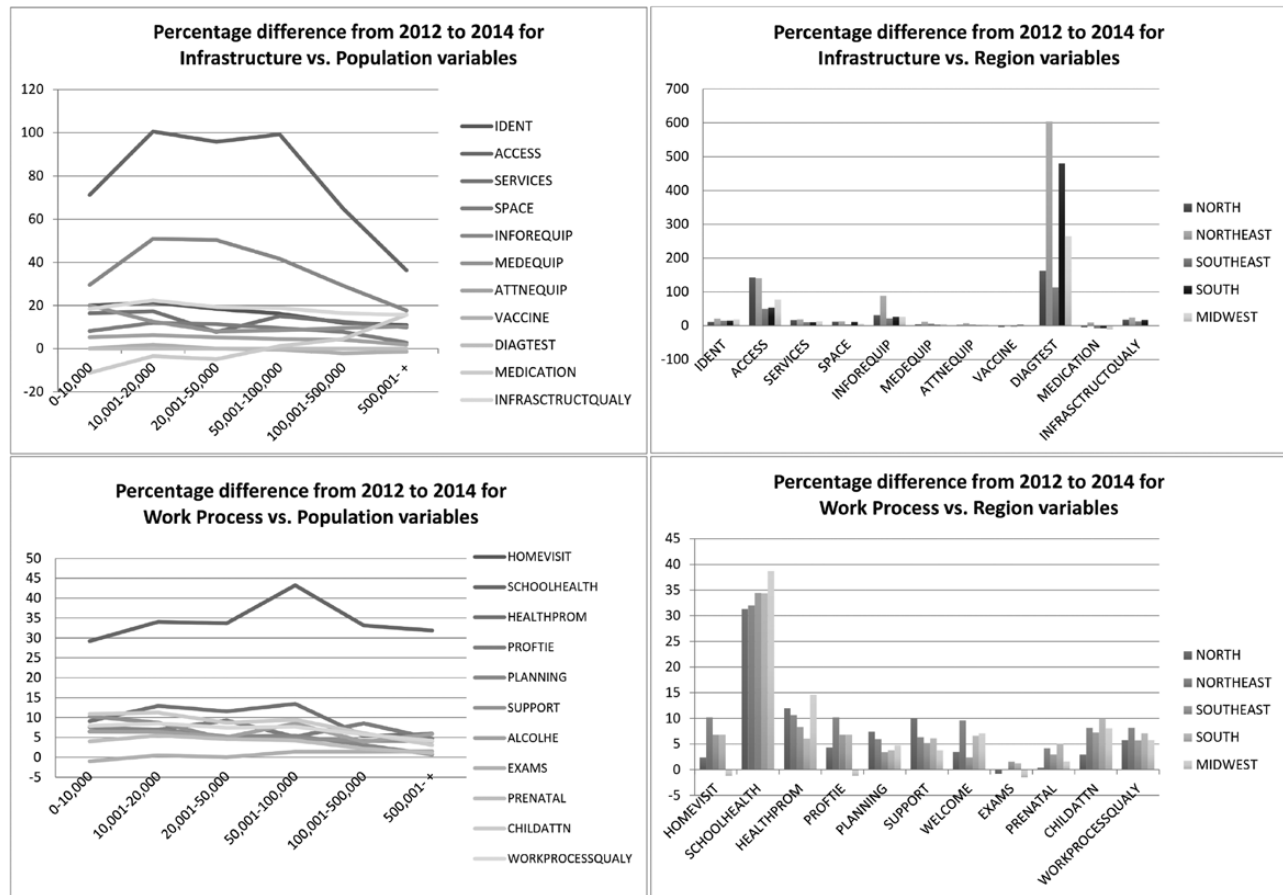


Figure 2. Graphs with the percentage difference from 2012 to 2014 regarding work process and infrastructure quality variables organized by region and municipality size.

support activities have helped to improve the quality and access of the population to health care in the country (27). A good PHC system is important to organize the health care network and is expected to solve 80% of the population health care needs (28).

The health activities performed in schools (SCHOOLHEALTH) varied significantly among the different city size and regions, whereas the offer of diagnostic test in the health unit (DIAGNOSTICTESTS) improved substantially among different regions and PHC accessibility (FACILITYACCESS) improved differently in the different city size. Some variables did not change over time: number of vaccines, medications and types of exams (VACCINE, MEDICATION and EXAMS). We hypothesize that the lack of change may be due to the original high-quality levels in 2012, leaving little space for change in 2014, which may have been the case particularly of the type of medical exams (EXAMS). Another possible explanation is the PHC has little control of the supply chain, which is the case of medicine (MEDICATION). As the acquisition of medication is regulated through several laws/regulations (29), which are stable over a short period of time, the time difference analysed may not have allowed change. Similarly, vaccinations (VACCINATIONS) are based on well-established national policy with little municipality autonomy, which may explain the lack of overall difference observed.

Financial reward

One may think that giving higher financial aid to municipalities with better PHC quality, which is what happens upon PMAQ evaluation, may increase inequities among FHT, as the ones in higher need of improvement are the ones receiving less financial aid. This does not

seem to occur in the Brazilian case. Financial reward is a potentially useful tool to promote the motivation necessary to achieve objectives in the context of health systems. However, Barreto (30) emphasizes that P4P, a type of financial reward, is more effective in short-term changes and on actions that require less effort from service providers of health. In this study, the higher percentage of overall changes happened in the infrastructure CI variables.

Our results within Brazil have implications elsewhere. We suggest policy may need to vary by municipality characteristics, and other PHC systems in the world may wish to take this into account when implementing policies to improve health services. According to Lotta and Pavez (22), the current model of building public policies, known as federative coordinating or recentralization, constitutes of nationally designed policies, such as large general patterns (31,32), implemented locally, from the appropriation of standards and rules by governments and local actors. However, during implementation, these types of policies get transformed/adapted and resignified by each administrative level. Then, policy implementation cannot be understood as ‘one reality’. Despite the fact that the policy is clearly defined by universal rules and or unified technical procedures that can be applied regularly, the outcomes are not necessarily predictable nor homogeneous. In this sense, the variation of the results may have more or less positive consequences in terms of equity of access to public services. It can facilitate the appropriation and adaptation of policies to the reality or context in which they are implemented, with the flexibility to consider the dynamics and complexity of the territories (22).

Table 2. Continued

Infrastructure variable (IS) versus population				Work process variable (WP) versus population							
Variable	city size population	2012	2014	% change	GEE <i>P</i> value	Variable	city size population	2012	2014	% change	GEE <i>P</i> value
VACCINE	0-10 000	0.694	0.695	0.05		EXAMS	0-10 000	0.929	0.920	-1.00	
	10 001-20 000	0.628	0.640	1.80			10 001-20 000	0.921	0.926	0.48	
	20 001-50 000	0.682	0.682	-0.03			20 001-50 000	0.935	0.935	0.03	
	50 001-100 000	0.743	0.740	-0.40	<i>P</i> = 0.0007		50 001-100 000	0.936	0.950	1.42	<i>P</i> < 0.001
DIAGNOSTICTESTS	100 001-500 000	0.770	0.753	-2.12		PRENATAL	100 001-500 000	0.948	0.961	1.41	
	>500 001	0.779	0.768	-1.39			>500 001	0.949	0.963	1.54	
	0-10 000	0.076	0.272	257.55			0-10 000	0.862	0.896	4.00	
	10 001-20 000	0.050	0.224	350.05			10 001-20 000	0.833	0.879	5.47	
MEDICATION	20 001-50 000	0.052	0.225	331.83		CHILDDATTENTION	20 001-50 000	0.843	0.882	4.61	
	50 001-100 000	0.063	0.244	290.04	<i>P</i> = 0.4517		50 001-100 000	0.858	0.895	4.23	<i>P</i> = 0.0004
	100 001-500 000	0.097	0.324	235.41			100 001-500 000	0.893	0.913	2.17	
	>500 001	0.167	0.415	148.94			>500 001	0.944	0.953	1.02	
INFRASTRUCTUREQUALITY	0-10 000	0.379	0.337	-11.16		WORKPROCESSQUALY	0-10 000	0.704	0.781	10.93	
	10 001-20 000	0.317	0.306	-3.41			10 001-20 000	0.702	0.780	11.23	
	20 001-50 000	0.342	0.325	-4.88			20 001-50 000	0.729	0.792	8.67	
	50 001-100 000	0.365	0.369	1.22	<i>P</i> < 0.001		50 001-100 000	0.737	0.806	9.45	<i>P</i> < 0.001
INFRASTRUCTUREQUALITY2	100 001-500 000	0.391	0.409	4.59		WORKPROCESSQUALY	100 001-500 000	0.792	0.840	6.09	
	>500 001	0.420	0.486	15.69			>500 001	0.868	0.894	3.09	
	0-10 000	0.530	0.627	18.47			0-10 000	0.699	0.754	7.92	
	10 001-20 000	0.468	0.572	22.36			10 001-20 000	0.685	0.743	8.52	
INFRASTRUCTUREQUALITY2	20 001-50 000	0.482	0.575	19.30		WORKPROCESSQUALY	20 001-50 000	0.704	0.756	7.44	
	50 001-100 000	0.500	0.595	18.86	<i>P</i> < 0.001		50 001-100 000	0.706	0.760	7.68	<i>P</i> = 0.0023
	100 001-500 000	0.532	0.619	16.44			100 001-500 000	0.736	0.778	5.77	
	>500 001	0.420	0.486	15.69			>500 001	0.783	0.815	4.16	

GEE, generalized estimated equation.

Table 3. Comparing values for Infrastructure and work process variables with country's regions in the evaluated years

Variable	Infrastructure variable (IS) versus region				Work process (WP) versus region						
	Country region	2012	2014	% change	GEE P value	Variable	Country region	2012	2014	% change	GEE P value
UNIDENTIFICATION	North	0.461	0.513	11.30	P < 0.001	LINKTOSERVICE	North	0.519	0.542	4.31	P < 0.001
	Northeast	0.483	0.585	21.12			Northeast	0.497	0.548	10.19	
	Southeast	0.575	0.659	14.71			Southeast	0.516	0.551	6.80	
	South	0.542	0.623	14.97			South	0.639	0.683	6.84	
	Midwest	0.453	0.535	18.15			Midwest	0.576	0.569	-1.22	
FACILITYACCESS	North	0.152	0.370	143.07	P < 0.001	PLANNING	North	0.734	0.788	7.38	P = 0.2701
	Northeast	0.166	0.401	140.71			Northeast	0.802	0.850	5.93	
	Southeast	0.364	0.545	49.71			Southeast	0.818	0.845	3.40	
	South	0.422	0.646	53.12			South	0.814	0.845	3.81	
	Midwest	0.276	0.490	77.47			Midwest	0.764	0.800	4.75	
SERVICESOFFERED	North	0.647	0.757	16.86	P < 0.001	CITYSUPPORT	North	0.760	0.836	9.96	P < 0.001
	Northeast	0.715	0.846	18.33			Northeast	0.852	0.906	6.34	
	Southeast	0.716	0.791	10.50			Southeast	0.860	0.905	5.22	
	South	0.798	0.882	10.54			South	0.830	0.880	6.10	
	Midwest	0.705	0.798	13.20			Midwest	0.792	0.823	3.80	
SPACEADEQUACY	North	0.547	0.613	11.96	P < 0.001	PATIENTWELCOME	North	0.712	0.737	3.45	P = 0.0026
	Northeast	0.579	0.655	13.13			Northeast	0.743	0.815	9.61	
	Southeast	0.672	0.698	3.87			Southeast	0.788	0.807	2.39	
	South	0.692	0.770	11.36			South	0.753	0.803	6.60	
	Midwest	0.656	0.695	6.02			Midwest	0.695	0.744	7.09	
INFORMATICEQUIP	North	0.220	0.288	31.07	P < 0.001	EXAMS	North	0.909	0.902	-0.79	P = 0.0109
	Northeast	0.152	0.287	88.61			Northeast	0.938	0.937	-0.07	
	Southeast	0.431	0.525	21.91			Southeast	0.941	0.956	1.57	
	South	0.519	0.655	26.23			South	0.935	0.947	1.22	
	Midwest	0.395	0.499	26.34			Midwest	0.938	0.924	-1.50	
MEDICALEQUIP	North	0.607	0.633	4.19	P < 0.001	PRENATAL	North	0.887	0.891	0.40	P < 0.001
	Northeast	0.614	0.686	11.89			Northeast	0.861	0.897	4.16	
	Southeast	0.705	0.748	6.11			Southeast	0.873	0.899	2.96	
	South	0.733	0.754	2.86			South	0.882	0.927	5.08	
	Midwest	0.687	0.725	5.45			Midwest	0.891	0.905	1.61	
HEALTHATTENTIONEQUIP	North	0.845	0.869	2.81	P < 0.001	CHILDDATTENTION	North	0.713	0.735	2.95	P = 0.9276
	Northeast	0.853	0.919	7.72			Northeast	0.750	0.811	8.16	
	Southeast	0.885	0.914	3.20			Southeast	0.775	0.831	7.26	
	South	0.920	0.942	2.46			South	0.762	0.838	9.97	
	Midwest	0.896	0.927	3.46			Midwest	0.725	0.783	8.03	
VACCINE	North	0.694	0.670	-3.49	P < 0.001	HEALTHPROMOTION	North	0.592	0.663	11.98	P = 0.0519
	Northeast	0.735	0.735	0.02			Northeast	0.598	0.662	10.66	
	Southeast	0.663	0.647	-2.34			Southeast	0.578	0.627	8.34	
	South	0.711	0.732	2.95			South	0.590	0.625	6.05	
	Midwest	0.720	0.734	1.97			Midwest	0.581	0.666	14.62	
DIAGNOSTICTESTS	North	0.111	0.292	162.83	P < 0.001	SCHOOLHEALTH	North	0.527	0.692	31.27	P < 0.001
	Northeast	0.031	0.220	603.66			Northeast	0.565	0.746	31.97	
	Southeast	0.132	0.281	112.80			Southeast	0.476	0.640	34.45	
	South	0.062	0.361	479.69			South	0.516	0.693	34.36	
	Midwest	0.076	0.278	264.53			Midwest	0.519	0.719	38.66	

Table 3. Continued

Infrastructure variable (IS) versus region				Work process (WP) versus region								
Variable	Country region	2012	2014	% change	GEE P value	Variable	Country region	2012	2014	% change	GEE P value	
MEDICATION	North	0.327	0.313	-4.23	P < 0.001	HOMEVISIT	North	0.519	0.532	2.39	P = 0.0119	
	Northeast	0.343	0.376	9.70			Northeast	0.497	0.548	10.19		
	Southeast	0.342	0.318	-7.26			Southeast	0.516	0.551	6.80		
	South	0.493	0.459	-6.91			South	0.639	0.683	6.84		
	Midwest	0.306	0.272	-11.04			Midwest	0.576	0.569	-1.22		
INFRASTRUCTUREQUALITY	North	0.452	0.532	17.70	P < 0.001	WORKPROCESSQUALY	North	0.690	0.730	5.79	0.0078	
	Northeast	0.459	0.571	24.45			Northeast	0.714	0.772	8.17		
	Southeast	0.542	0.613	13.10			Southeast	0.722	0.763	5.74		
	South	0.582	0.682	17.18			South	0.741	0.793	7.10		
	Midwest	0.597	0.595	-0.28			Midwest	0.709	0.750	5.80		
INFRASTRUCTUREQUALITY2	North	0.446	0.520	16.59	P < 0.001							
	Northeast	0.452	0.558	23.45								
	Southeast	0.530	0.598	12.83								
	South	0.572	0.674	17.83								
	Midwest	0.498	0.581	16.67								

GEE, generalized estimated equation.

Conclusion

Despite similar support of PMAQ across the country, improvements are not predictable nor homogeneous. Non-uniform improvements were seen in Brazil's PHC. These initial findings suggest that financial reward it is a potentially useful tool to improve health systems, but additional support may be needed in regions that lag behind in quality improvements.

Supplementary material

Supplementary material is available at *Family Practice* online.

Declaration

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Ethical approval: Public and freely available secondary data was used in this study. Ethical committee approval not necessary.

Conflict of interest: none.

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