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Characterization of primary health care for patients with diabetes based on the PMAQ-AB

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Abstract *This article aims to present a proposal for making the instruments used in the three cycles of the PMAQ-AB compatible and to analyze the information on access, coverage, structure, organization and provision of services in PHC related to care for DM in Brazil, according to regions, from the perspective of family health professionals and users. We performed an analysis of the degree of compatibility of the PMAQ-AB questions (2012, 2014 and 2017). To analyze the temporal evolution of the components, we performed a proportion difference test. We calculated the percentage difference between the perspective of professionals and users, per year analyzed, for Brazil. In general, there was an improvement in the quality of care and examinations, except for the diabetic foot. Worse results were found for the North region in relation to the other regions. Despite the structural improvement and the quality of care reported by professionals, there are significant gaps in the quality of care for patients with DM in the SUS. In the scenario of scarce investment added to the growing prevalence of DM, obstacles become progressively more challenging. Therefore, monitoring and evaluating the quality of services provided are essential tasks of the Brazilian Health System.*

Key words *Type 2 Diabetes Mellitus, Diabetes Complications, Primary Health Care, Medical Examination, Quality of Health Care*

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Introduction

The prevalence of Type 2 Diabetes Mellitus (DM) in Brazil was 9.2% in 2013, ranging from 6.3% in the North region to 12.8% in the Southeast[1]. Of these, it is estimated that half are unaware of the disease[1,2]. The progressive growth in the number of patients with type 2 DM is due to factors such as aging, nutritional transition, and urbanization. A study by the *International Diabetes Federation* estimated that Brazil had the fifth largest population with diabetes (16.8 million) in 2019, being only behind China, India, the United States, and Pakistan[3]. In addition, DM is among the diseases that most cause loss of healthy life years[4].

With access to health services, adequate treatment, therapeutic adherence, and continuous monitoring, people with DM can have a superior quality of life. However, when neglected, this disease can cause severe transient and/or permanent complications, such as neuropathy, retinopathy, blindness, nephropathy, diabetic foot, and amputations[1]. Therefore, the Ministry of Health established in the year of 2013 a protocol for screening and care of people with DM in Primary Health Care (PHC)[5]. In this protocol, a list of clinical exams and care routines were listed that, when correctly performed, allow the early identification of the disease, and its treatment[5].

It is important to emphasize that, in addition to the population's quality of life, the adequacy of health care for patients with DM can avoid unnecessary costs for the Unified Health System (SUS)[6,7].

The monitoring and evaluation of the adequacy of care for patients with diabetes are essential to prevent the worsening of the disease and deaths. It is known that, as well as the prevalence, care for patients with diabetes varies widely across the national territory[1]. Knowing the gaps in the health system allows the evaluation and reformulation of public policies and strategies to face the DM problem, especially in a country of continental dimensions like Brazil. However, it is essential to maintain this monitoring, since it identifies points of optimization in the health care policy.

The National Program for the Improvement of Access and Quality of Primary Care (PMAQ-AB) was established in 2011 with the objective of expanding access and improving the quality of PHC, ensuring a quality standard in the country and greater transparency and effectiveness of governmental actions[8]. The three available cycles (2012, 2014, and 2017) present valuable information related to DM. Despite its relevance, it is noteworthy that over the cycles some issues were modified, making it difficult to keep on monitoring.

It is noteworthy that in the Brazilian context, the expression "primary care" is still used in initiatives adopted by the government, in the composition of widely used abbreviations, such as PMAQ-AB, PNAB, and SIAB, which would otherwise be incomprehensible. However, we adopted the term "Primary Health Care", which is currently in the international literature[9].

This article aims to present a proposal for the compatibility of the instruments used in the three cycles of the PMAQ-AB and to analyze the information on access, coverage, structure, organization, and offer of services in PHC related to DM care in Brazil, according to regions, from the perspective of family health teams and users.

Materials and methods

The external evaluation instruments of the PMAQ-AB from the 2012, 2014, and 2017 cycles were used as data sources. According to the National Registry of Health Establishments (CNES), in 2012, 43,947 Basic Health Units (BHU) were accounted. However, the cycle 1 database outlines 38,812 BHU, 88.3% of the forecastrecast[10]. In cycles 2 and 3, 24,055 BHU (62% of the 2012 quantity) and 30,346 (78.2%) were measured, respectively. Modules II were used, aimed at family health teams, and Module III at BHU users.

Issues Compatibility

The PMAQ-AB instruments changed in the analyzed period. When comparing cycle 1 (2012) with cycles 2 (2014) and 3 (2017), it is noted that some questions were added, deleted, or modified, making it necessary to make them compatible, with a detailed description of the criteria adopted.

We used some compatibility features between the years to ensure the greatest possible comparability, with minimal loss of information, as described below: (a) Using synonyms or similar questions without changing the meaning, or with minor changes; (b) Use of questions with varying answer types (such as switching from a single answer to a multiple-choice answer or from a categorical answer to a continuous answer); (c) Use of complementary response categories (when the question is asked in one year in a positive sense

and in another in a negative sense); and, (d) The use of proxy questions of the measured construct (when the questions refer to the same or a similar concept, even though the target population is different).

In the analysis of the compatible questions, a classification was carried out regarding the degree of comparability of the same, as follows: (1) Total: When the formulation of the question is the same, (2) High: When there are minor changes in the manner of asking but no change in the meaning (for example, when using synonyms or matching similar/complementary answer categories); and, (3) Medium: When there are significant changes in the way of asking but it is still possible to compare (when the terms used are not synonymous but refer to the same concept/object of analysis, or when it refers to a different population group). Questions with low comparability, which require greater effort to approach concepts or investigate objects, were excluded from the analysis. Some questions were kept even though they were available for only one or two years, given their relevance to the topic.

The compatibilizations carried out in Module II (teams) were described in Chart 1, and those referring to Module III (users) are found in Chart 2. In these charts, you can see the identification of the question in this article, characterized by "TQ" (Team Question) or "UQ" (User Question), followed by the original variable used in the matching, the category or categories of response used, and the degree of comparability, according to previously defined criteria.

Analysis

From the compatibility, the respective response percentages were estimated for each question, both for Module II - Team (Table 1) and Module III - User (Table 2). For both, proportion difference tests were carried out between the years 2012, 2014, and 2017 for Brazil, with a significance level of 5%.

The questions that can be paired and compared between the Team and Users modules are presented in Table 3, to facilitate the analysis. Additionally, for this last table, the percentage difference between the teams' and users' perspectives was calculated for each analyzed year, only for Brazil.

The analyses were performed using the Statistical Package for the Social Sciences (SPSS), version 21.

Results

In Module 2 (Teams), of the 28 selected questions, only four remained unchanged throughout the cycles. Most of the questions (17) had high compatibility, and for 6 problems, significant changes were found, but it was still possible to compare them using a conceptual or proxy approximation. Question TQ16 about offering educational and health promotion actions for the prevention and treatment of DM was discontinued after 2012. Other questions in this module, such as TQ05, UQ06, TQ11, TQ17, TQ19, TQ20, TQ27, and TQ28, were unavailable for one of the years (Chart 1).

In Module 3 (Users), of the 26 selected questions, half did not change between cycles, 11 had minor modifications, maintaining high comparability, and two questions were discontinued as of 2012 (UQ16 and UQ17). Several questions from this module were also excluded in one of the cycles, namely UQ04, UQ08, UQ09, UQ10, UQ11, UQ12, UQ14, UQ15, UQ24, and UQ26 (Chart 2).

Table 1 presents the characterization of coverage, structure, organization, and service offering in PHC according to the teams. As for coverage (TQ01), it was found that the percentage of teams that reported having a population discovered by AB in the surroundings of the territory covered little changed between 2012 and 2017, reaching 34.4% in the last year. Regions such as the North (52%), and the Midwest (55%) had higher percentages. Great progress was observed in the implementation of electronic medical records (TQ02), especially in the North and Northeast, which went from 3.5% and 1.3% of units with medical records in 2012 to 12.0% and 8.5% in 2017.

Still in relation to the structure of the units, almost all the teams reported every year that the users who arrive at the BHU spontaneously seeking care have their needs heard and evaluated (TQ03). The proportion of teams that say they provide urgent and emergency care (TQ04) increased in the period in all regions.

In 2017, only the North region (86.1%) was still not close to 100%. Since 2012, almost all teams said that their respective units had an exam scheduling center (TQ05). Regarding the proportion of teams that report having reserved spaces when necessary (TQ06), scheduling appointments and actions for users of programs or priority groups that need continued care (TQ07), and for users with diabetes (TQ08), these were at around 90% every year.

Chart 1. Compatibility of questions from module 2 (Family Health Teams) of the National Program for Improving Access and Quality of Primary Care (PMAQ-AB) between the years 2012, 2014, and 2017.

Id.	2012		2014		2017		Comparability between years
	Variable	Category	Variable	Category	Variable	Category	
TQE01	II.13.7	Yes	II.10.5	Yes	II.6.3	Yes	Total
TQE02	II.14.5	Yes	II.11.3	Yes	II.12.3.1.4	Electronic medical record - Yes	High
TQE03	II.15.4	Yes	II.12.1	Yes	II.10.1	Yes	High
TQE04	II.15.8	Yes	II.12.8.9	No	II.10.5.1	Urgent care	High
TQE05	II.18.2.2	Test scheduling	Unavailable		II.12.8.2	Test scheduling	Total
TQE06	II.15.14	Yes	II.12.6	Yes	Unavailable		High
TQE07	II.16.6	Yes	II.13.1.4	Continuing care consultations	II.9.2	(01) The next appointment is scheduled at the end of the previous appointment; (02) The appointment is scheduled by the team and then communicated to the user	Medium
TQE08	II.16.7.8	Users with DM - Yes	II.14.3.3	DM - Yes	II.18.8	Yes	High
TQE09	II.16.8	Yes	II.13.3	Yes	II.10.5.2	Renewal of drug prescriptions (General) - Yes	Medium
TQE10	II.17.3	Yes	II.14.4.13	Uses no protocol - No	II.12.9.6	All categories except "No route defined"	Medium
TQE11	II.17.4.6	DM - Yes	Unavailable		II.10.6	Yes	Medium
TQE12	II.26.3	Yes	II.14.2.6	Of people with diabetes - Yes	II.18.5	Yes	High
TQE13	II.26.4	Yes	II.14.4.6	DM - Yes	II.18.4	Yes	High
TQE14	II.26.5	Yes	II.14.5.3	DM - Yes	II.18.3	Yes	Medium
TQE15	II.26.6	Yes	II.14.6.2	Diabetes - Yes	II.18.6	Yes	High
TQE16	II.31.1.8	DM prevention and treatment - Yes	Unavailable		Unavailable		-
TQE17	II.31.1.9	Conducts groups to support self-care for chronic diseases - Yes	II.26.1.9	Activities in groups aimed at supporting self-care for chronic diseases	Unavailable		High
TQE18	II.32.4	Yes	II.28.3	Yes	II.25.4	Yes	High
TQE19	II.32.5.4	Diabetics at fault - Yes	II.14.7.11	DM - Yes	Unavailable		High
TQE20	II.26.1	Scheduling any day of the week, any time	II.12.12	Any day of the week, any time	Unavailable		Medium
TQE21	II.17.5.1	Creatinine - Yes	II.15.1.1	Creatinine - Yes	II.12.2.4	Creatinine - Yes	High
TQE22	II.17.5.2	Lipid profile - Yes	II.15.1.2	Lipid profile - Yes	II.12.2.9	Lipid profile - Yes	High
TQE23	II.17.5.3	Electrocardiogram - Yes	II.15.1.3	Electrocardiogram - Yes	II.12.2.6	Electrocardiogram - Yes	High
TQE24	II.17.6.1	Glycosylated hemoglobin - Yes	II.15.1.5	Glycosylated hemoglobin - Yes	II.12.2.7	Glycosylated hemoglobin - Yes	High

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Chart 1. Compatibility of questions from module 2 (Family Health Teams) of the National Program for Improving Access and Quality of Primary Care (PMAQ-AB) between the years 2012, 2014, and 2017.

Id.	2012		2014		2017		Comparability between years
	Variable	Category	Variable	Category	Variable	Category	
TQE25	II.17.10.1	Fasting blood glucose - Yes	II.15.2.1	Fasting blood glucose - Yes	II.12.2.3	Fasting blood glucose - Yes	High
TQE26	II.17.10.5	Urine culture or urine summary (type I urine) - Yes	II.15.2.10	Urine culture or urine summary (type I urine) - Yes	II.12.1.11 + II.12.1.12	Urine summary (type I urine) - Yes + Urine culture - Yes	High
TQE27	II.26.7	Yes	Unavailable		II.18.9	Yes	Total
TQE28	II.26.8	Yes	Unavailable		II.18.10	Yes	Total

Note: TQ01: II.13.7, II.10.5, II.6.3 (Is there a population discovered by primary care in the surroundings of the territory covered by the team?); TQ02: II.14.5, II.11.3, (Is there electronic medical records implemented in the team?), II.12.3.1.4 (What is the institutional flow of communication? Electronic medical records?); TQ03: II.15.4 (Do all users who arrive at the health unit spontaneously seeking care have their needs heard and evaluated?), II.12.1, II.10.1 (Does the team host spontaneous demand in this unit?); TQ04: II.15.8 (Does the team perform urgent and emergency care at this health unit?), II.12.8.9 (Does not perform urgently and emergency care), II.10.5.1 (In meeting spontaneous demand, the team performs: Urgent care); TQ05: II.18.2.2; II.12.8.2 (Which scheduling centers are available? - Exam scheduling); TQ06: II.15.14 (If the user has a problem that it is not recommended to schedule it for another day, is there a reservation for service on the same day?), II.12.6 (Is there reservation of vacancies for consultations of spontaneous demand?); TQ07: II.16.6 (Does the team schedule consultations and actions for users who are part of priority programs or groups and need continued care?), II.13.1.4 (The professionals' agenda is organized to carry out which actions? - Consultations for continued care), II.9.2 (About the demand for continued care, how is the appointment made? - 01. The next appointment is scheduled at the end of the previous appointment and 02. The appointment is scheduled by the team and then communicated to the user); TQ08: II.16.7.8 (For which groups and situations does the team schedule offers? - Users with DM), II.14.3.3 (The team schedules consultations offer for which situations? - DM), II.18.8 (The team schedules consultations and examinations of people with DM due to the stratification of cases and elements considered by her in the management of care?); TQ09: II.16.8, II.13.3 (Does the team renew prescriptions for users of continued care/programs such as hypertension and diabetes, without the need to schedule medical appointments?), II.10.5.2 (In meeting spontaneous demand, the team performs: - Renewal of medication prescriptions); TQ10: II.17.3 (Are there protocols in the health unit that guide the prioritization of cases that need a referral?), II.14.4.1.3 (Does the team use protocols for risk stratification for which situations? - Does not use protocols - No); II.12.9.6 (When a user is treated at the health unit and needs to be referred for specialized consultation, what are the possible ways?); TQTQ11: II.17.4.6 (Does the team have protocols with the definition of therapeutic guidelines for DM), II.10.6 (Does the team use protocols/criteria to guide the conduct of cases treated at the reception?); SQ12: II.16.3, II.18.5 (Does the team use any registration or follow-up form for people with DM?), II.14.2.6 (Does the team have a record of its territory: People with DM); TQ13: II.26.4 (Does the primary care team have a record of people with DM at greater risk/severity?), II.14.5.3 (Does the team use risk stratification protocols for which situations? - DM), II.18.4 (Does the team have a record of users with diabetes with higher risk/severity?); TQ14: II.26.5 (The team schedules consultations and examinations of people with DM according to the stratification of cases and elements considered by it in the management of care?), II.14.5.3 (Does the team's agenda schedule comply with the classified risk, for which situations? - DM), II.18.3 (Does the team use protocols for risk stratification of users with diabetes?); TQ15: II.26.6, II.18.6 (Does the team coordinate the waiting list and follow-up of users with DM who need consultations and exams at other points of care?), II.14.6.2 (Does the team keep a record of high-risk users referred to other points of care? - Diabetes); TQ16: II.31.1.8 (The team offers educational and health promotion actions aimed at DM prevention and treatment); TQ17: II.31.1.9 (The team offers educational and health promotion actions to conduct groups to support self-care for chronic diseases), II.26.1.9 (The team offers educational and health promotion actions health aimed at Activities in groups aimed at supporting self-care for chronic diseases); TQ18: II.32.4, II.28.3 (Do community health agents have visits scheduled according to the priorities of the entire team?), II.25.4 (Are families in the area covered by the team visited at different intervals according to risk and vulnerability assessments?); TQ19: II.32.5.4 (In the home visits of ACS, an active search is carried out in the territory of: Diabetic absentees), II.14.7.1.1 (The team carries out an active search in the following situations: DM); EQ20: II.26.1, II.12.12 (How are appointments for people with DM scheduled??); TQ21: II.17.5.1 (Which tests are requested by the primary care team: For systemic arterial hypertension? - Creatinine), II.15.1.1 (Which of these tests are requested by your team and are performed by the health services network? - Creatinine), II. 12.2.4 (General - Which of these tests are requested by your team to be performed in the health services network? - Creatinine); SQ22: II.17.5.2 (Which tests are requested by the primary care team: For systemic arterial hypertension? - Lipid Profile), II.15.1.2 (Which of these tests are requested by your team and performed by the health services network? - Lipid Profile), II.12.2.9 (General - Which of these tests are requested by your team to be performed in the health services network? - Lipid Profile); TQ23: II.17.5.3 (Which tests are requested by the primary care team: For systemic arterial hypertension? - Electrocardiogram), II.15.1.3 (Which of these tests are requested by your team and are performed by the health services network? - Electrocardiogram); II.12.2.6 (General - Which of these tests are requested by your team to be performed in the health services network? - Electrocardiogram); SQ24: II.17.6.1 (Which tests are requested by the primary care team: For DM? - Glycosylated hemoglobin), II.15.1.5 (Which of these tests are requested by your team and performed by the health services network? - Glycosylated Hemoglobin), II.12.2.7 (General - Which of these tests are requested by your team to be performed in the health services network? - Glycosylated Hemoglobin); TQ25: II.17.10.1 (What tests are requested by the primary care team: For prenatal care? - Fasting blood glucose), II.15.2.1 (Which of these tests are requested by your team and performed by the health services network for prenatal care? - Fasting blood glucose), II.12.2.3 (General - Which of these tests are requested by your team to be performed in the health services network? - Fasting blood glucose); SQ26: II.17.10.5, II.15.2.10, II.12.2.11, and .12 (Which tests are requested by the primary care team: For prenatal care? - Urine culture or urine summary (type I urine)); SQ27: II.26.7, II.18.9 (Does the team perform a diabetic foot exam periodically?); SQ28: II.26.8, II.18.10 (Does the team perform an eye fundus examination periodically?).

Source: National Program for Improving Access and Quality of Primary Care (PMAQ-AB), 2012, 2014, and 2017.

Chart 2. Compatibility of questions from module 3 (users) of the National Program for Improving Access and Quality of Primary Care (PMAQ-AB), between the years 2012, 2014, and 2017.

Id.	Question	2012		2014		2017		Comparability between years
		Variable	Category	Variable	Category	Variable	Category	
UQU01	Sex: (1) Male / (2) Female	III.4.6	Male/ Female	III.3.1	Male/ Female	III.3.1	Male/ Female	Total
UQU02	Elderly people (60 years old or older)	III.4.7	60 years old or older	III.3.2	60 years old or older	III.3.2	60 years old or older	Total
UQU03	Is literate	III.4.11	Yes	III.3.4	Illiterate (cannot read nor write)	III.3.5	Illiterate (cannot read nor write)	High
UQU04	Has a paid job currently	III.4.14	Yes	III.3.5.0	Sim	Unavailable		High
UQU05	The family is part of the *Bolsa Família* Program	III.4.16	Yes	III.4.1	Sim	III.5.4	Is part of the program	High
UQU06	Lives near the health unit	III.5.2	(1) Close + (2) Fair	III.5.1	Up to 20 minutes (Categories 1 and 2)	III.4.1	Up to 20 minutes	High
UQU07	Is normally able to schedule an appointment for the same day	III.6.3	Yes	III.6.3	Yes	III.6.4	Yes	Total
UQU08	Is attended most of the time when goes to the health unit without making an appointment	III.7.1	Yes	Unavailable		III.6.9	Yes	High
UQU09	The guidance that professionals give at the unit always meets the needs	III.7.5	Yes, always	Unavailable		III.8.16	Yes, always	Total
UQU10	Thinks that the team seeks to solve their needs in the unit itself	III.8.1	(1) Yes, always + (2) Yes, sometimes	III.8.1	(1) Always + (2) Most of the time	Unavailable		Total
UQU11	Sought care the last time a health problem that was considered urgent appeared	III.7.7	Yes	Unavailable		III.7.1	Yes	High
UQU12	The office for the service is a reserved place with privacy	III.8.2	Yes	III.8.2	Yes	Unavailable		Total
UQU13	In consultations, team professionals perform the physical examination by touching the body to examine	III.8.3	(1) Always + (2) Most of the time	III.8.3	(1) Always + (2) Most of the time	III.8.2.1	Yes	High

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Regarding attention, the proportion of teams that say they renew prescriptions for users of continued care/programs such as hypertension and diabetes without the need for an appointment (TQ09) increased in all regions in the analyzed period, reaching 94.3% in 2017. In 2012, between 32.5% (Midwest) and 56.2% (Southeast) of the teams reported that the units had protocols for prioritizing cases that needed referral (TQ10). In 2014, this percentage almost doubled in most regions, and in 2017, it practically reached the total.

Regarding the existence of specific protocols for patients with diabetes (TQ11), in 2012, approximately 70% of the units in the country had

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Id.	Question	2012		2014		2017		Comparability between years
		Variable	Category	Variable	Category	Variable	Category	
UQU14	Is always guided by the professionals of this team on the care that must be taken to recover, such as: the need for rest, adequate food, and others	III.8.4	Always	III.8.4	Always	Unavailable		High
UQU15	Is always guided by the professionals of the team on the signs that indicate improvement or worsening	III.8.5	Always	III.8.5	Always	Unavailable		High
UQU16	The professional takes notes in the medical record or form during consultations	III.8.6	Yes	Unavailable		Unavailable		-
UQU17	Professionals remember what happened on the last appointments	III.9.13	Yes	Unavailable		Unavailable		-
UQU18	Always needs to ask questions after consultations and has ease to talk to the professionals who attended him/her	III.9.14	Always	III.9.7	Always	III.8.15	Always	Total
UQU19	When treatment is interrupted by the patient for some reason, or he/she does not come to the consultation at this health unit, the professionals seek him/her out to find out what happened and continue care.	III.9.16	Yes	III.9.9	Always	III.8.8	Always	Total
UQU20	A doctor has told you that you have diabetes	III.16.1	Yes	III.21.1	Yes	III.17.1	Yes	Total
UQU21	Got a consultation with a doctor because of diabetes in the last six months	III.16.2	Yes	III.21.2	Yes	III.17.2	Yes	High

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them. In 2017, it increased to 90%, except for the North region (75%). In 2012, the registration form or monitoring of people with DM (TQ12) was already being used in almost all units (92.8% in Brazil). In 2014, this indicator was below 90% for all regions, and it returned to the initial level in 2017.

The percentage of teams that have a record of people with DM at higher risk/severity (TQ13) in the country went from 52% in 2012 to 80% in 2017. Despite having increased, the North region (69.4%) stands out negatively, reporting about 10 percentage points lower than that observed at the national level. The scheduling of consultations and exams for people with DM (TQ14) showed gradual growth over the years for all regions, reaching 89.1% in the country in 2017. The coordination of the waiting list and monitoring of users with DM (TQ15) was done by about half of the teams in 2012, a figure that practically doubled in the country in 2017, reaching 80.9%.

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Id.	Question	2012		2014		2017		Comparability between years
		Variable	Category	Variable	Category	Variable	Category	
UQU22	Had a fasting blood test to measure blood sugar in the last six months	III.16.4	Yes	III.21.3	Yes	III.17.4	Yes	Total
UQU23	A healthcare professional has done the foot exam in the last six months	III.16.5	Yes	III.21.4	Yes	III.17.5	Yes	Total
UQU24	In the last six months, a member of the health team advised on foot care	III.16.6	Yes	Unavailable		III.17.6	Sim	High
UQU25	Has already left the appointment with the next appointment scheduled	III.16.7	Yes	III.21.5	Yes	III.17.7	Yes	Total
UQU26	Takes medicine for diabetes	III.16.8	Yes	III.21.6	Yes	Unavailable		Total

Note: UQ01: III.4.6, III.3.1 (Gender); UQ02: III.4.7, III.3.2 (How old are you?); UQ03: III.4.11 (Do you know how to read and write?), III.3.4 (How long have you studied?), III.3.5 (Up to which grade have you) did you study?); UQ04: III.4.14 (Do you currently have paid work?), III.3.5.0 (Do you work?); UQ05: III.1.16 (Is your family registered in the *Bolsa Família* program?), III.4.1 (Are you a *Bolsa Família* beneficiary?), III.5.4 (Regarding the *Bolsa Família* Program, does your family: Participates in the program); UQ06: III.5.2 (What do you think about the distance from your house to this health unit?), III.5.1 (How long do you take from your house to this one? health unit?), III.4.1 (How long does it take you from your home to this basic health unit/health post?); UQ07: III.6.3, III.6.4 (When you manage to make an appointment, is it generally for the same day?); UQ08: III.7.1 (Most of the time you come to the US without an appointment, can you be heard?) UQ09: III.7.5, III.8.16 (Do the guidelines provided by professionals at the unit meet your needs?) UQ10: III.8.1 (When you are treated at this health unit, do you think that the team seeks to solve your needs/problems in the health unit itself?); UQ11: III.7.7 III.7.1 (Did you seek care the last time you had an urgent health problem?), III.7.2 (Did you seek care from this Basic Health Unit/Health Center the last time you had an urgent health problem?), III.8.2 (Is the consultation room a reserved space (does it have privacy)?); UQ13: III.8.3a (Does the team perform a physical examination on you and touch your body to examine?), III.8.3b (Do team professionals perform a physical examination, examine your body, throat, and belly?), III.8.2.1 (In consultations in this unit, do the team professionals examine your body (e.g., legs, belly, throat, etc.)?) UQ14: III.8.4a (How often do the professionals on this team guide you in consultations on the care you should take to recover, such as the need for rest, adequate food, and others?) III.8.4b (Do the professionals advise you on the need for rest, adequate food, and how to take the medication?) UQ15: III.8.5a (In consultations, are you guided by the professionals of this team about the signs that indicate that you are improving or getting worse?), III.8.5b (Do health professionals advise you on what to do when your symptoms are getting worse?); UQ16: III.8.6 (During consultations, does the professional make notes in the patient's chart or file?); UQ17: III.9.13 (Do the professionals remember what happened in your last consultations?); UQ18: III.9.4, III.9.7, III.8.15 (Do you find it easy to communicate with the professionals who attended you after consultations?); UQ19: III.9.16, III.9.9, III.8.8 (When you discontinue treatment for any reason or fail to appear for a consultation at this health unit, the professionals look for you to find out what happened and resume care); UQ20: III.16.1, III.21.1, III.17.1 (Has a doctor told you that you have diabetes (high blood sugar)?); UQ21: III.16.2, III.17.2 (Have you seen a doctor because of diabetes (high blood sugar) in the last six months?), III.21.2 (Have you) consulted with a doctor or nurse because of diabetes (high blood sugar) in the last six months?) UQ22: III.16.4, III.21.3, III.17.4 (Have you had a fasting blood sugar test in the last six months?); UQ23: III.16.5, III.21.4, III.17.5 (Has any professional from the health team examined your feet in the last six months? UQ24: III.16.6 (Did any professional advise you on foot care in the last six months?), III.17.6 (Did any health team professional advise you on foot care in the last six months?); UQ25: III.16.7, III.21.5, II.17.7 (You already leave the appointment with the next appointment scheduled); UQ26: III.16.8, III.21.6 (Do you take medication for diabetes?).

Source: National Program for Improving Access and Quality of Primary Care (PMAQ-AB), 2012, 2014, and 2017.

As for the support and tracking of people with diabetes, the percentage of teams that offered educational actions, promotion, prevention, and treatment of DM (TQ16) was 89.5% in 2012 in the country. The proportion of support groups (TQ17) increased significantly between the years in all regions, reaching 71.5%. Despite this, even in the last year, the North region presented 60% of realization, below the national measure. The schedule of ACS visits (TQ18) was reported by the teams for most units in 2012 and progressively increased, reaching almost 100% in 2017; 88% of the teams, decreased to 73% in 2014, being less pronounced in the North and Midwest regions. Despite the growth, the proportion of teams that schedule appointments for people with DM on any day of the week and at any time (TQ20) remains low, at 60% in Brazil. In the North (49%) and Northeast (51.4%) regions, this value is even lower.

Table 1. Coverage, structure and organization, and provision of services in Primary Health Care, related to care for Diabetes Mellitus, according to regions. Brazil, 2012, 2014, and 2017.

	Question	Year	N	NE	SE	S	MW	BR*
Unit cover and structure	TQ01. There is a population discovered by Primary Care in the surroundings of the territory covered by the team	2012	46,3	34,1	28,9	29,9	56,2	33,6
		2014	54,6	37,7	29,8	30,1	56,0	36,1
		2017	52,0	34,9	26,7	30,3	55,0	34,3
	TQ02. There is an electronic medical record implanted in the team	2012	3,5	1,3	18,0	30,3	20,9	14,0
		2014	2,9	1,3	20,1	32,9	18,4	13,9
		2017	12,0	8,5	21,0	52,9	33,7	21,5
	TQ03. All users who arrive at the health unit spontaneously seeking care have their needs heard and evaluated.	2012	91,5	96,5	98,6	98,1	94,4	97,2
		2014	93,1	95,4	98,8	98,5	96,5	96,9
		2017	98,2	98,7	99,6	99,3	99,5	99,1
	TQ04. The team performs urgent and emergency care at the health unit	2012	60,1	68,2	75,7	81,6	67,1	72,8
		2014	86,1	92,6	96,6	95,8	92,5	94,0
		2017	85,7	96,4	94,8	97,0	94,7	95,0
	TQ05. There is an exam scheduling center available at the health unit	2012	92,1	97,1	96,3	92,7	92,0	95,4
		2014	-	-	-	-	-	-
		2017	95,6	98,2	98,1	96,6	97,3	97,7
	TQ06. There are reservations for same-day service in case any user needs it	2012	89,5	92,9	93,1	90,5	90,4	92,2
		2014	81,8	86,3	90,6	88,9	84,5	87,7
		2017	-	-	-	-	-	-
	TQ07. There is a schedule of consultations and actions for users of programs or priority groups who need continued care	2012	90,6	92,5	91,4	89,2	86,4	91,0
		2014	83,5	92,2	90,3	85,8	84,1	89,3
		2017	93,1	95,2	95,1	91,6	89,1	94,0

it continues

Regarding the tests indicated for people with diabetes, almost all teams reported that they requested and carried out tests for creatinine (TQ21), lipid profile (TQ22), electrocardiogram (TQ23), glycosylated hemoglobin (TQ24), fasting blood glucose (TQ25) and urine (TQ26), in all years investigated. The proportion of teams that reported performing a diabetic foot exam grew significantly between the years, in all regions, from an average of 57.8% to 80.1%. The proportion of eye fundus examinations (TQ28), despite remaining low, grew in the North and Northeast regions, reaching 29% and 38.6% in 2017, while the other regions showed a decrease in this percentage. In 2017, the performance of eye fundus examinations according to the teams was 32.9% in the country.

Table 2 describes demographic and socioeconomic aspects of users and information on access, structure, and adequacy of services in PHC related to care for Diabetes Mellitus. It was found that about 80% of the responding users were female (UQ01). The elderly (UQ02) account for approximately 22% of respondents, ranging from 15% in the North and Northeast regions to almost 30% in the South and Southeast.

The proportion of respondents who can read and write (UQ03) gradually increased in the analyzed period, from 84.8% to 94.6% in Brazil. Until 2014, 1/3 of the respondents had paid work (UQ04) in the country, with this percentage being higher in the South (44.1%). In 2012, the proportion of respondents who were beneficiaries of the *Bolsa Família* Program (UQ05) dropped for all regions in 2014 (31.6% in Brazil) and remained unchanged in 2017.

When analyzing access to the health service, it was found that between 2012 and 2017, in Brazil, more than 80% of respondents reported living close to the health unit (UQ06). In all the years investigated, approximately half of the interviewees said that they are normally able to schedule an appointment for the same day (UQ07), except for the Southeast region (28.4% in 2017). The proportion of users who said they could be heard when they go to the health unit even without

Table 1. Coverage, structure and organization, and provision of services in Primary Health Care, related to care for Diabetes Mellitus, according to regions. Brazil, 2012, 2014, and 2017.

	Question	Year	N	NE	SE	S	MW	BR*
Organization of care for patients with diabetes	TQ08. There are schedule queries and actions for users with DM	2012	88,0	90,1	87,1	84,9	83,9	87,6
		2014	96,1	98,0	92,3	81,9	92,4	93,1
		2017	89,7	95,2	91,6	88,7	91,4	92,4
	TQ09. Renewal of prescriptions is carried out for users of continued care/programs such as hypertension and diabetes, without the need to schedule medical appointments	2012	84,2	82,9	84,3	75,8	70,4	81,5
		2014	87,1	88,0	85,5	79,8	83,9	85,5
		2017	96,7	97,7	90,8	92,2	95,1	94,3
	TQ10. There are protocols in the health unit that guide the prioritization of cases that need a referral	2012	33,4	32,5	56,2	39,2	32,2	42,7
		2014	60,5	79,4	87,6	78,0	63,9	79,4
		2017	99,6	99,8	99,9	99,8	99,8	99,8
	TQ11. There are protocols in the health unit that guide the prioritization of cases that need a referral for DM	2012	66,6	60,5	80,3	67,0	60,4	69,5
		2014	-	-	-	-	-	-
		2017	75,0	89,9	91,6	88,8	86,5	88,9
	TQ12. The team uses some form of registration or monitoring of people with DM	2012	97,0	95,3	92,3	88,0	91,7	92,8
		2014	87,1	89,7	90,5	88,3	85,8	89,3
		2017	91,1	94,0	91,0	90,1	91,3	92,0
	TQ13. The team has a record of people with DM with higher risk/severity	2012	51,4	46,6	59,8	49,0	41,7	52,0
		2014	46,9	57,3	77,1	64,5	52,6	64,0
		2017	69,4	83,1	80,3	79,9	80,2	80,4
	TQ14. The team schedules consultations and examinations for people with DM according to the stratification of cases and elements considered by it in the management of care	2012	73,6	80,9	78,9	66,7	67,6	76,5
		2014	69,4	84,9	79,1	70,9	69,1	78,5
		2017	82,4	91,3	89,1	87,7	87,6	89,1
	TQ15. The team coordinates the waiting list and monitoring of users with DM who need consultations and exams at other points of care	2012	44,5	47,9	50,5	47,1	51,9	48,8
		2014	46,3	53,2	59,4	53,0	49,4	54,5
		2017	73,9	85,5	83,6	71,6	72,0	80,9
	TQ16. The team offers educational and health promotion actions aimed at the prevention and treatment of DM	2012	92,1	90,1	88,2	89,6	92,0	89,5
		2014	-	-	-	-	-	-
		2017	-	-	-	-	-	-
	TQ17. Conducts groups with the aim of supporting self-care for chronic diseases	2012	47,8	47,7	56,7	61,7	51,1	53,7
		2014	60,0	69,1	76,0	74,1	69,4	71,5
		2017	-	-	-	-	-	-
	TQ18. The CHAs have the schedule of visits made according to the priorities of the entire team	2012	88,7	93,6	90,7	89,5	87,8	91,1
		2014	89,4	96,1	93,7	92,4	91,6	93,9
		2017	96,9	99,2	98,1	97,8	97,8	98,4
	TQ19. The CHAs have a schedule of visits for absent diabetics	2012	92,2	89,5	90,2	80,0	87,5	88,2
		2014	80,7	73,5	72,8	66,7	77,6	73,1
		2017	-	-	-	-	-	-
	TQ20. Are appointments scheduled for people with diabetes mellitus performed on any day of the week, at any time?	2012	45,3	37,5	61,4	53,7	51,3	50,7
		2014	49,0	51,4	69,3	65,0	59,7	60,0
		2017	-	-	-	-	-	-

it continues

Table 1. Coverage, structure and organization, and provision of services in Primary Health Care, related to care for Diabetes Mellitus, according to regions. Brazil, 2012, 2014, and 2017.

	Question	Year	N	NE	SE	S	MW	BR*
Exams carried out in the unit	Which of these tests are requested by your team and performed by the health services network?							
	TQ21. Creatinine	2012	95,7	96,5	98,4	97,5	95,8	97,3
		2014	93,8	97,1	98,7	98,7	95,4	97,5
		2017	96,9	98,8	98,0	99,5	98,7	98,5
	TQ22. Lipid profile	2012	85,2	89,3	95,0	94,7	94,4	92,5
		2014	82,0	88,8	96,7	96,1	91,5	92,3
		2017	89,3	95,2	97,2	98,6	96,8	96,0
	TQ23. Electrocardiogram	2012	87,0	91,7	96,6	94,3	92,1	93,7
		2014	86,7	94,0	98,6	97,6	95,7	95,7
		2017	93,5	97,5	98,1	99,2	98,2	97,7
	TQ24. Glycosylated hemoglobin	2012	81,9	89,4	97,4	95,0	86,8	92,8
		2014	80,2	90,2	96,6	95,7	84,9	92,1
		2017	85,5	94,2	96,4	99,0	93,2	94,9
	TQ25. Fasting blood glucose	2012	99,6	99,4	97,5	97,5	98,6	98,3
		2014	98,7	99,2	98,4	97,9	98,4	98,6
		2017	98,7	99,3	98,2	99,6	99,1	98,9
	TQ26. Urine culture or urine summary (type I urine)	2012	93,0	98,6	96,2	96,8	95,1	96,8
		2014	88,2	97,3	96,6	96,6	88,8	95,7
		2017	97,9	99,5	97,1	98,2	98,5	98,3
	TQ27. Does the team perform a diabetic foot exam periodically?	2012	54,7	58,1	59,5	55,3	56,2	57,8
		2014	-	-	-	-	-	-
		2017	74,9	83,6	80,3	74,5	78,3	80,1
	TQ28. Does the team perform an eye fundus examination periodically?	2012	24,6	33,7	52,1	34,0	34,6	40,3
		2014	-	-	-	-	-	-
		2017	29,0	38,6	31,3	25,4	30,1	32,9

*P-value of the difference of proportions test <5% for all variables.

Source: National Program for Improving Access and Quality of Primary Care (PMAQ-AB), module II, 2012, 2014, and 2017.

making an appointment (UQ08) was 66.5% in 2012 and rose to 74.3% in 2017.

In 2012, the percentage of users who reported that the guidelines received by professionals always meet their needs (UQ09) was 52% in the country, lower in the North (42.5%) and Midwest (45.9%). This percentage increased in 2014, reaching over 80% in all regions except the North (75.3%). In 2014, over 87% of users thought that the team sought to solve their needs in the unit itself (UQ10). In Brazil, 63% sought care the last time they had a health problem that they considered urgent (UQ11). In the North region, this percentage was lower, at 56% in 2017, and in the South, it was higher (70%).

Regarding the structure and adequacy of care, almost all respondents thought that the place for care is a reserved place with privacy (UQ12) (94.6%). The proportion of users who reported that professionals performed a physical examination in consultations (UQ13) increased from 74% in 2012 to 69,2% nationwide. The biggest decrease occurred in the Southeast and South regions, which went from 78,9% and 76.4% in 2012 to 69.9% and 70% in 2017, respectively. Receiving guidance on care for their recovery (UQ14), was reported by 73% of respondents in 2014. The percentage of those who indicated that they had always received guidance from the team on the signs that indicate improvement or worsening (UQ15) was similar (67.7% in 2014).

Almost all respondents (95.3%) stated that during consultations, professionals make notes in their medical records or files (UQ16).

Table 2. Demographic and socioeconomic aspects of users and information on access, structure, and adequacy of services in Primary Health Care related to care for Diabetes Mellitus, according to regions. Brazil, 2012, 2014, and 2017.

	Question	Year	N	NE	SE	S	MW	BR*
Demographic and socioeconomic aspects	UQ01. Male	2012	20,9	16,1	23,3	33,1	23,1	22,3
		2014	20,7	15,6	22,0	26,5	23,2	20,4
		2017	21,8	18,3	22,6	26,5	23,4	21,6
	UQ01. Female	2012	79,1	83,9	76,7	66,9	76,9	77,7
		2014	79,3	84,4	78,0	73,5	76,8	79,6
		2017	78,2	81,7	77,4	73,5	76,6	78,4
	UQ02. Elderly people (60 years old or older)	2012	15,6	16,6	30,7	22,6	32,3	24,0
		2014	15,1	16,4	29,8	25,7	28,9	23,3
		2017	15,9	15,5	29,1	27,5	20,9	22,2
	UQ03. Is literate	2012	84,5	79,1	87,3	91,6	82,2	84,8
		2014	94,0	89,3	93,6	96,3	92,1	92,4
		2017	94,9	92,5	95,4	97,5	95,6	94,6
	UQ04. Has a paid job currently	2012	28,6	24,4	32,8	44,2	30,2	31,4
		2014	34,7	28,8	31,7	44,1	35,5	33,1
		2017	-	-	-	-	-	-
	UQ05. The family is part of the *Bolsa Família* Program	2012	53,6	62,2	26,5	21,0	27,5	39,0
		2014	40,8	50,4	20,2	14,3	22,2	31,6
		2017	44,2	49,4	19,8	13,7	21,1	31,9
Access	UQ06. Lives near the health unit	2012	82,2	86,0	87,9	87,4	85,8	86,7
		2014	78,3	80,9	84,7	83,7	80,6	82,4
		2017	78,6	82,0	85,4	85,2	83,1	83,4
	UQ07. Is normally able to schedule an appointment for the same day	2012	51,6	57,6	35,9	57,8	55,6	48,7
		2014	48,4	54,5	31,3	47,2	51,3	44,7
		2017	41,2	52,4	28,4	42,6	48,7	41,7
	UQ08. Is attended most of the time when goes to the health unit without making an appointment	2012	57,4	64,0	68,2	73,8	58,2	66,5
		2014	-	-	-	-	-	-
		2017	66,8	72,1	76,1	79,5	75,1	74,3
	UQ09. The guidance that professionals give at the unit always meets the needs	2012	42,5	50,2	55,4	58,5	45,9	52,8
		2014	-	-	-	-	-	-
		2017	75,3	81,7	81,5	82,2	81,5	81,2
	UQ10. Thinks that the team seeks to solve their needs in the unit itself	2012	90,7	93,6	93,3	96,0	92,3	93,6
		2014	87,4	88,7	88,2	90,7	88,4	88,7
		2017	-	-	-	-	-	-
	UQ11. Sought care the last time a health problem that was considered urgent appeared	2012	64,7	58,7	63,5	71,1	61,0	63,0
		2014	-	-	-	-	-	-
		2017	56,1	65,7	60,2	70,0	58,2	63,0

it continues

Only half (50.3%) of them said that professionals remembered what happened in their last consultations (UQ17) in 2012.

Although it remains low, the percentage that said it was easy to talk to the professionals who attended them (UQ18) increased, from 46.1% in 2012 to 54.3% in 2017. In 2012, only 25% of users said that the professionals looked for them to find out what happened and to resume care when they interrupted treatment or missed appointments (UQ19). In 2014, there was a slight drop in all regions, but in 2017 the value practically doubled, reaching 51.6% in the whole country.

It was found that the proportion of patients with DM (UQ20) ranged from 9.4% (North and Northeast) to 16.5% (Southeast) in 2017, without great variation from previous years. As for the specific aspects of care for patients with

Table 2. Demographic and socioeconomic aspects of users and information on access, structure, and adequacy of services in Primary Health Care related to care for Diabetes Mellitus, according to regions. Brazil, 2012, 2014, and 2017.

	Question	Year	N	NE	SE	S	MW	BR*
Structure and adequacy of attention	UQ12. The office for the service is a reserved place with privacy	2012	91,5	93,3	95,6	96,0	94,6	94,6
		2014	93,0	93,5	94,9	96,6	95,6	94,6
		2017	-	-	-	-	-	-
	UQ13. In consultations, team professionals perform the physical examination by touching the body to examine	2012	59,7	70,7	78,9	76,4	67,7	74,0
		2014	59,4	66,6	70,4	73,8	65,5	68,4
		2017	60,9	70,1	69,9	70,0	68,3	69,2
	UQ14. Is always guided by the professionals of this team on the care that must be taken to recover, such as: the need for rest, adequate food, and others	2012	61,2	66,4	71,2	68,7	63,0	68,1
		2014	68,5	72,0	73,0	79,8	69,8	73,1
		2017	-	-	-	-	-	-
	UQ15. Is always guided by the professionals of the team on the signs that indicate improvement or worsening	2012	53,7	60,4	66,3	66,1	60,4	63,2
		2014	62,2	65,5	68,7	75,0	64,3	67,7
		2017	-	-	-	-	-	-
	UQ16. The professional takes notes in the medical record or form during consultations	2012	95,4	95,2	95,8	95,3	92,4	95,3
		2014	-	-	-	-	-	-
		2017	-	-	-	-	-	-
	UQ17. Professionals remember what happened on the last appointments	2012	44,2	47,5	54,3	50,2	46,4	50,3
		2014	-	-	-	-	-	-
		2017	-	-	-	-	-	-
	UQ18. Always needs to ask questions after consultations and has ease to talk to the professionals who attended him/her	2012	38,0	46,4	48,0	46,5	38,9	46,1
		2014	38,4	42,4	44,1	49,2	44,7	43,9
		2017	48,8	56,0	52,5	56,3	56,6	54,3
	UQ19. When treatment is interrupted by the patient for some reason, or he/she does not come to the consultation at this health unit, the professionals seek him/her out to find out what happened and continue care	2012	25,8	24,5	27,7	22,1	20,0	25,1
		2014	21,6	18,7	22,8	19,8	18,2	20,4
		2017	57,5	51,0	52,7	47,7	50,7	51,6
Special care for patients with diabetes	UQ20. A doctor has told you that you have diabetes	2012	8,9	8,1	16,5	11,4	15,4	12,4
		2014	9,4	9,7	17,9	13,8	17,3	13,7
		2017	9,4	9,4	16,5	14,0	11,9	12,6
	Assessment for patients with diabetes only							
	UQ21. Got a consultation with a doctor because of diabetes in the last six months	2012	87,3	87,8	90,6	86,1	87,9	89,0
		2014	87,0	84,6	82,9	80,4	81,5	83,0
		2017	86,9	88,0	85,4	85,6	87,9	86,4
	UQ22. Had a fasting blood test to measure blood sugar in the last six months	2012	91,8	89,4	89,8	90,3	90,4	89,9
		2014	91,1	88,5	87,5	88,3	89,9	88,3
		2017	89,7	89,0	86,8	89,4	89,6	88,2
	UQ23. A healthcare professional has done the foot exam in the last six months	2012	21,2	24,4	34,7	27,1	30,5	30,5
		2014	21,5	25,2	35,2	28,9	28,3	30,4
		2017	25,3	36,5	36,5	31,3	32,1	34,7
	UQ24. In the last six months, a member of the health team advised on foot care	2012	37,6	41,9	49,8	40,5	46,0	45,9
		2014	-	-	-	-	-	-
		2017	43,0	51,3	47,1	40,9	44,0	46,8
	UQ25. Has already left the appointment with the next appointment scheduled	2012	39,4	37,3	35,1	28,0	33,7	34,6
		2014	32,9	30,7	28,4	24,6	25,4	28,3
		2017	39,6	46,7	37,3	31,2	36,0	39,0
	UQ26. Takes medicine for diabetes	2012	86,1	87,4	92,1	85,6	88,6	89,6
		2014	84,8	88,6	92,9	86,7	89,9	90,2
		2017	-	-	-	-	-	-

*P-value of the difference of proportions test <5% for all variables.

Source: National Program for Improving Access and Quality of Primary Care (PMAQ-AB), module III, 2012, 2014, and 2017.

Table 3. Comparison between compatible questions from Module II (teams) and Module III (users), in cycles 1, 2 and 3 of PMAQ AB, according to regions. Brazil, 2012, 2014, and 2017.

Team Question (QE) / User Question (UQ)	Year	Team (TQ)						User (UQ)						Dif. %
		N	NE	SE	S	MW	BR	N	NE	SE	S	MW	BR	BR
TQ03. All users who arrive at the health unit spontaneously seeking care have their needs heard and evaluated	2012	91,5	96,5	98,6	98,1	94,4	97,2	42,5	50,2	55,4	58,5	45,9	52,8	-45,6
	2014	93,1	95,4	98,8	98,5	96,5	96,9	-	-	-	-	-	-	-
X UQ09. The guidelines that professionals give at the unit always meet your needs	2017	98,2	98,7	99,6	99,3	99,5	99,1	75,3	81,7	81,5	82,2	81,5	81,2	-18,0
TQ04. Team performs urgent and emergency care at the health unit	2012	60,1	68,2	75,7	81,6	67,1	72,8	64,7	58,7	63,5	71,1	61,0	63,0	-13,4
X	2014	86,1	92,6	96,6	95,8	92,5	94,0	-	-	-	-	-	-	-
UQ11. You sought care the last time you had a health problem that you considered urgent	2017	85,7	96,4	94,8	97,0	94,7	95,0	56,1	65,7	60,2	70,0	58,2	63,0	-33,7
TQ08. There are schedule queries and actions for users with DM	2012	88,0	90,1	87,1	84,9	83,9	87,6	39,4	37,3	35,1	28,0	33,7	34,6	-60,5
X	2014	96,1	98,0	92,3	81,9	92,4	93,1	32,9	30,7	28,4	24,6	25,4	28,3	-69,6
UQ25. Already leave the appointment with the next appointment scheduled	2017	89,7	95,2	91,6	91,6	91,6	92,4	39,6	46,7	37,3	31,2	36,0	39,0	-57,8
TQ19. The CHAs have a schedule of visits for absent diabetics	2012	92,2	89,5	90,2	80,0	87,5	88,2	25,8	24,5	27,7	22,1	20,0	25,1	-71,5
X	2014	80,7	73,5	72,8	66,7	77,6	73,1	21,6	18,7	22,8	19,8	18,2	20,4	-72,0
UQ19. When he interrupts the treatment for some reason or does not come to the consultation at this health unit, the professionals seek him out to find out what happened and resume care	2017	-	-	-	-	-	-	57,5	51,0	52,7	47,7	50,7	51,6	-
TQ25. Which of these tests are requested by your team and performed by the health services network: Jeju blood glucose	2012	99,6	99,4	97,5	97,5	98,6	98,3	91,8	89,4	89,8	90,3	90,4	89,9	-8,6
	2014	98,7	99,2	98,4	97,9	98,4	98,6	91,1	88,5	87,5	88,3	89,9	88,3	-10,5
X UQ22. Had a fasting blood test to measure blood sugar in the last six months	2017	98,7	99,3	98,2	99,6	99,1	98,9	89,7	89,0	86,8	89,4	89,6	88,2	-10,9
TQ27. Does the team perform a diabetic foot exam periodically?	2012	54,7	58,1	59,5	55,3	56,2	57,8	21,2	24,4	34,7	27,1	30,5	30,5	-47,3
X	2014	-	-	-	-	-	-	21,5	25,2	35,2	28,9	28,3	30,4	-
UQ23. Has any health care professional had their feet checked in the last six months	2017	74,9	83,6	80,3	74,5	78,3	80,1	25,3	36,5	36,5	31,3	32,1	34,7	-56,6

Source: National Program for Improving Access and Quality of Primary Care (PMAQ-AB), modules II and III, 2012, 2014, and 2017.

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diabetes, in 2012, almost 90% of users said they had consulted with a doctor because of diabetes in the last six months (UQ21). In 2014, there was a small decrease in this proportion, going to 83% in Brazil and growing again in 2017 (86.4%).

The proportion of people with diabetes who had a blood test in the last six months (UQ22) was approximately 90% over the entire period. Despite having increased, the number of foot exams performed in the last six months (UQ23) was less than 35% of the country in 2017. The North region stands out negatively, with only 25.3% of this exam performed even in the last year. Less than half of users reported having received guidance from professionals about foot care in the last six months (UQ24). The percentage of users who reported leaving the service with the next appointment scheduled was 34.6% in 2012, falling to 28.3% in 2014 and rising to 39% in 2017. Among the regions, the South had the lowest percentage in the last year, with 31.2%, and the North and Northeast had the highest, with 39.6% and 46.7%, respectively. The use of medication for diabetes was around 90% for the entire period.

The comparative analysis between the perspectives of teams and users shows that the perception of users and teams about listening and providing guidance improved between 2012 and 2017, reducing the difference between them. The teams' perspective on the provision of urgent care improved between 2012 and 2017, but there is no variation in users' perception, which makes the difference between the increase (Table 3).

Regarding the scheduling of consultations and actions for users with DM, there was no significant variation between the groups, and the difference between the perspectives remain high, being greater than 50%. Regarding the active search of users when there is an interruption of treatment or lack of consultation, the greatest difference was found between perspectives, despite the decrease reported by the team from 2012 to 2014 and the users' reports having practically doubled between 2012 and 2017 in all regions.

The question that had the least variation between team and user and in all years was about the performance of the fasting blood glucose test. There is a variation of about 10% between teams and users in performing the blood glucose test, although all the values found are high (above 87%). As for the diabetic foot exam, the teams' perspective on its performance improved between 2012 and 2017, but there was no variation in the users' perception, which makes the difference between them increase.

Discussion

PHC is a relevant tool for organizing access to services in the health system. The monitoring and evaluation of the PHC implementation process have been the best for improving the health care provided around the world. Health prevention and promotion actions are the premises responsible for their effectiveness in guiding the flow of care[9]. In this study, considerable variations were not found for PHC coverage in the three PMAQ cycles. However, as pointed out by Kovacs *et al.*[11], over the cycles, there is an improvement in the PMAQ score in geographic areas with lower economic levels, pointing to the importance of implementing the program to reduce health inequality. From the users' perspective, in general, there was an improvement in the structure of health units and in the adequacy of patient care.

The findings of this article are in line with what was observed in studies that indicate a greater number of teams in the Northeast and Southeast regions, and a smaller number in the North[12]. In general, the North region stood out negatively in relation to the others in terms of access, structure, and adequacy of health care.

Given the importance of PHC and regional differences, it is essential to prioritize health care in terms of promotion and prevention, especially for patients with DM, due to the high prevalence and consequent complications of the disease, to the detriment of the absence or inadequate care. Despite this, it was observed that only 50% of users said that professionals sought them out when they interrupted treatment or missed appointments.

Adequate guidance and well-defined care flows are important. Thus, the organization of the care flow through PHC allows to save finite resources in the health area, since the cost of prevention is much lower compared to the treatment and, occasionally, the complications caused by the disease and the consequent need for re-hospitalization[6]. It is noteworthy that the costs are not limited to the financial, they also reflect a considerable social impact, as well as denote a perception on the part of the user of low quality of service provided.

In the care of patients with diabetes, carrying out periodic examinations is essential in the prevention of diseases resulting from the dis-

ease. Patient follow-up, as recommended in the DM protocol in the country, constitutes a more financially sustainable strategy, as a higher cost of treatment is expected for individuals who live longer with the disease or who have developed complications, due to the greater demand for medicines and frequency of examinations[13-15]. As observed by Muzy *et al.*[1], for exams recommended for patients with diabetes, there was a higher demand than the supply.

The performance of diabetic foot examinations has grown considerably over the years, according to the teams. However, this result is not confirmed from the perspective of users, who reported that only 1/3 of the population had been tested in 2017. Less than half of users reported having at least received guidance from professionals on foot care. The low performance of foot examinations was also reported in other studies, which pointed to a possible association with a higher incidence of foot wounds and amputations[1,16]. Consequently, the lack of tools for continuous monitoring of the performance of the exam becomes even more serious, given its relevance and low cost of execution.

The performance of eye fundus exams by the teams remained low, reaching 32.9% in the country in 2017. The literature indicates that there is a greater demand than the offer of follow-up services for patients with diabetes, such as insufficient performance fundus examination (40%), with wide regional variation (North 25% - Southeast 52%), reflecting a high prevalence of retinopathy[1,17]. It is also noteworthy the low or no knowledge about this complication among SUS users[18].

Although the glycated hemoglobin test is one of the essential tests for people with diabetes[19], only 70% of subjects reported having done so in the last year. It is noted that more than half of the patients diagnosed with diabetes showed changes in the exams, indicating that the disease was not controlled[1] and highlighting problems in tracking and monitoring. Deficiencies in health care for patients with diabetes lead to higher morbidity, hospitalizations (15%), and visits to emergency rooms (27% - PMAQ). Carrying out care monitoring exams for patients with DM is a primary activity of PHC and is fundamental to reducing the burden of DM and its chronic complications.

The search for emergency and urgent care is an important indicator of service quality, as well as access to medication and adherence to medication therapy. The findings point to an increase in the search for urgent and emergency services, indicating potential problems in the care process. In this sense, the increase in the search for emergency care can be used as a sentinel event and enable the inference of other important indicators to be monitored, aiming to understand the obstacles in the flow of care that have an impact on the quality of PHC[20].

A medical consultation is a moment of meeting with the health professional and encompasses the activities of measuring low-complexity clinical parameters, nutritional monitoring, guidance and verification of therapeutic adherence, and evaluation of drug treatment and prescription adjustments. Despite the increase in the investigated period, the percentage of users who reported leaving the service with the next appointment was still low in 2017 (39%). It is noteworthy that the good organization of care and continuity of care may reflect improved access to medication and treatment[21] and glycemic control[22], particularly in the context of chronic diseases. It is noteworthy that the renewal of prescriptions does not necessarily reflect the optimization of care, but it may indicate a weakness in the health system, pointing to inadequate follow-up.

In general, this study highlights the mismatch between the increase in the prevalence of DM and the network of services needed to monitor patients with DM. It was not observed that there was such a considerable improvement in the indicators of users when compared to teams. When analyzing the compatible questions between the groups, the difference between the team's and the user's perspective is maintained; it reduces extraordinarily little or even increases. Despite an improvement in access and structure to health services, this was not reflected in specific care for patients with diabetes. In general, the indicators that have improved for this group are those that were already at acceptable levels. The lower access to services and structure in the North and Northeast regions can be reflected in the low proportion of patients with DM, which shows failures in screening and, consequently, in the adequacy of care.

In the scenario portrayed, the situation was already worrying, but a worsening is still expected with the imminent increase in the prevalence of people with diabetes and with the amplification of gaps in health care, potentiated by the underfunding of the SUS. There is still the aggravating factor of the COVID-19 pandemic of 2019[23], which may have led to treatment abandonment, and to a lower frequency of examinations and

medical consultations[24] and changes in lifestyle[25] among people with chronic diseases.

In the context of the COVID-19 pandemic, with the overwhelming number of cases and the crisis in the health system, PHC has a fundamental role in controlling the growth curve of the pandemic and in guaranteeing the sufficiency of ICU beds as well as an alternative, safer, and more efficient way to face the pandemic, to prevent the collapse of the health system[26]. The longer the person-to-person transmission takes, the more manageable the situation will be for SUS[27]. Considering patients with DM, this follow-up is even more relevant since there are biochemical characteristics and the additional risk that this disease can determine the progression of COVID-19[28]. COVID-19 patients who have diabetes are twice as likely to develop severe disease. Likewise, these patients are also at nearly twice the risk of mortality due to COVID-19 disease[29].

The scope of this article does not cover supplementary health, or even individuals who are not being monitored by any health service. The data presented here reflect the care provided to people with diabetes who are already part of the public service. It is noteworthy that even when dealing only with people who have already had access to the diagnosis, the monitoring conditions are not ideal, especially when comparing the perspectives of the user and the PHC teams.

Considering the three cycles of the PMAQ-AB, it is important to note that in 2012, there may have been a bias toward voluntary participation as only the units that considered themselves best evaluated adhered to the external evaluation process, culminating in better results from the teams' perspective. In the second cycle, in 2014, there was an important reformulation in the construction of the instrument, with the exclusion of specific modules on chronic diseases, which caused a loss of continuity of research. In 2017, there was a rescue of the 2012 instrument referring to these specific modules, as well as an expansion of the coverage of the teams, approaching the totality of the register.

Finally, the loss of the PMAQ-AB is regrettable because until then it was the only SUS monitoring tool for some services recommended in the care protocol for patients with diabetes, such as the diabetic foot exam. It is also worth mentioning that the loss of essential questions in some years or even the incompatibility due to changes in the instruments reduces the longitudinal of the comparisons. Despite this, from the PMAQ-AB data, this study showed regional differences, both between the perspectives of teams and users and between the years, which reinforces the potential and relevance of the continuous production of this information.

Final considerations

Despite the structural improvement and the quality of care reported by the teams, there is an important distance between this perspective and that of the users. It is possible that the user does not perceive or understand so clearly the service provided by the team, or that the team reports providing a better service than what was delivered. livered. Despite this, the differences presented here are important and deserve attention as they show significant gaps in the quality of care for patients with DM in SUS.

The current health scenario in Brazil is challenging. The event of the COVID-19 pandemic that began in 2019 presents itself as another complicating factor in this context of increasingly restricted investment in the health field. Faced with all the challenges already reported by the APS regarding the treatment of patients living with DM, the current health situation particularly faces us with increasingly challenging obstacles.

From this perspective of crisis and health constraints, it is important to emphasize that the current pandemic situation that the world is going through allows us to identify points of subjection in the health system and other support structures linked to it will have to face to effectively face it.

It is worth remembering that the problems that once existed do not stop manifesting themselves, nor the impediment of new ones to arising, so that the idea of recognizing weaknesses and actions to support the current system is fundamental, to try to respond to old and recent problems.

The scenario presented in 2012, although not ideal, took place in the context of strengthening the Unified Health System (SUS). With the increasing prevalence of DM and the reduction in investment in public health, it is essential to reflect on the care of people with diabetes in the coming years. Thus, the current pandemic scenario exacerbates health conditions that were already fragile and consequently causes greater discrepancies in problem-solving and guaranteeing access to and quality of health services.

Collaborations

J Muzy was responsible for the conception, study design, data analysis and interpretation, and the review and approval of the final version of the manuscript. M Campos was responsible for the conception, study design, analysis and data interpretation. I Emmerick was responsible for the analysis, data interpretation, review and approval of the final version of the manuscript. FG Avelar was responsible for the analysis, data interpretation and general review of the manuscript.

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