Chronic low back pain treatment in Brazil: inequalities and associated factors

Dalia Elena Romero (https://orcid.org/0000-0002-2643-9797) [1]
Jéssica Muzy (https://orcid.org/0000-0003-2526-2317) [1]
Leo Maia (https://orcid.org/0000-0003-1531-0880) [2]
Aline Pinto Marques (https://orcid.org/0000-0002-9072-5333) [1]
Paulo Roberto Borges de Souza Júnior (https://orcid.org/0000-0002-8142-4790) [1]
Débora Castanheira (https://orcid.org/0000-0001-6995-1259) [3]

[1] Departamento de Informações para a Saúde, Fiocruz. Av. Brasil 4365, Manguinhos. 21040-900 Rio de Janeiro RJ Brasil. dalia.fiocruz@gmail.com
[2] Instituto de Comunicação e Informação Científica e Tecnológica em Saúde, Fiocruz. Rio de Janeiro RJ Brasil.
[3] Instituto de Estudos Sociais e Políticos, Universidade do Estado do Rio de Janeiro. Rio de Janeiro RJ Brasil.

Abstract *Chronic low back pain (LBP) is one of the most common diseases in the world and one of the leading causes of years of life lost due to disability. Despite being a major public health concern, studies on access to and use of different types of treatment are scarce. The aim of this article is to describe the most common treatments for chronic LBP in Brazil, examine the factors associated with the use of these treatments, and discuss possible inequalities in the use of physical therapy/exercise and medications. A descriptive analysis was performed using data from the 2013 National Health Survey. Multiple logistic regression was conducted to determine the association between treatment use and demographic, socioeconomic, health status, access to health services, and geographical characteristics. People with higher education were 2.39 times more likely to do physiotherapy. However, no association was found between education level and medication use. People in social class A/B were almost twice as likely to do physical therapy. However, there was no association between social status and medication use. People with a very high or high degree of functional limitation were 3.5 times more likely to use medication. However, no association was observed between functional limitation and physical therapy use.*

Key words *Spine, Health inequalities, Physical therapy, Pharmacological treatment*

Introduction

Chronic low back pain (LBP) is one of the most common diseases in the world. It is also one of the leading causes of years of life lost due to disability worldwide and the most common cause in high-middle-income countries like Brasil[1]. Prevalence of chronic LBP in Brazilian adults in 2013 was 18.5%[2-4], which is similar to rates observed in other countries[5]. chronic LBP is among the most common conditions for which patients seek medical care[6,7], seriously affects quality of life, and is the leading cause of retirement due to disability[8]. In addition, the financial burden of chronic LBP is high, including high direct and indirect costs due to absenteeism, loss of productivity[9], and spending on medication, physical therapy, and surgery[10].

Data on the prevalence of chronic LBP in Brazil has been collected since 1998 via the complementary health surveys of the National Household Sample Survey. However, information on age at onset of chronic LBP, degree of functional limitation, and treatment type only began to be collected with the advent of the National Health Survey (NHS) in 2013, thus providing a deeper insight into this disease. Although some recent publications have addressed this theme[2-4], studies of the use of treatments for chronic LBP using representative samples of the Brazilian population do not exist.

The international literature shows that the most commonly used interventions are medications and physical therapy/exercise. While the former are generally used in acute phases[11], the latter are related to preventive practices[12]. Studies identifying the most commonly used treatments for back pain with representative samples of the Brazilian population do not exist.

The literature clearly shows the importance of interventions for the prevention and control of noncommunicable diseases, principally because it is these interventions that prevent functional impairment[13]. It can therefore be said that physical therapy/exercise is essential for improving the health of individuals with chronic LBP. Systematic reviews of the international literature show that rehabilitation with a focus on exercise, education, and active patient involvement is effective in reducing functional limitations caused by chronic LBP[14,15]. However, other studies show that medications, primarily analgesics, are the most widely used intervention[11,16].

There is a lack of consensus on why medication use is generally preferred over other types of treatment. However, a population-based study conducted in Canada (n = 113,229) reported differences in access to services and types of treatment are largely explained by socioeconomic inequalities. The same study showed that the utilization of health services for chronic LBP was lower in individuals with lower education levels and socioeconomic status and that the type of treatment used varied according to sex, age and health status[17].

In Brazil, the few studies that exist on types of treatment for chronic LBP are limited in terms of geographic reach and sample size. A study undertaken in Pelotas (n = 3,100) showed that the most widely-prescribed treatment for back problems was physical therapy and that the use of this treatment was greater among people with higher economic status[18]. Another study conducted in Belo Horizonte (n = 76) reported that 85.5% of older persons with chronic LBP did not use physical therapy and that one of the main reasons was treatment waiting lists[19].

In Brazil, there are no nationwide epidemiological studies on types of treatment for chronic LBP and the factors that determine inequalities. This study therefore aimed to identify the most common treatments for chronic LBP in Brazil, examine the factors associated with the use of these treatments, and discuss possible inequalities in the use of physical therapy/exercise (as a proxy for preventive practices) and medications (as a proxy for interventions in the acute phase).

Methodology

Information source

This study used microdata from the 2013 National Health Survey (NHS), a household survey conducted by the Brazilian Institute of Geography and Statistics (IBGE). The central objective of the NHS is to characterize the health status and life styles of the population and collect information on healthcare, and health services, and access to health services[20].

The NHS uses a three-stage cluster sampling design (tracts, families, and individuals). In the first stage, primary units of analysis (PUA) are selected from the master sample by simple random sampling (SRS). In the second stage, a fixed number of permanent private households are selected from each PUA selected in the first stage also using SRS. In the third stage, a household member aged 18 years and older is randomly se-

lected from each household to respond the third (individual) section of the questionnaire.

The questionnaire is divided into three sections, the first two of which contain questions on living conditions and the socioeconomic and health status of household members. The third section, which contains questions on morbidity and life style, is individual and answered by the household member aged 18 years and older selected above[21]. This household member is selected from a list of eligible household members drawn up by the interviewer[20]. The prevalence of chronic LBP was calculated using the NHS sample (60,202 people aged 18 years and older). The dataset on treatment for chronic LBP included only individuals who self-reported the condition, resulting in a sample of 11,118 individuals.

Variables

Chronic LBP was defined based on the following dichotomous (yes/no) question: *Do you have a back problem, such as lower back or neck pain, sciatica, vertebrae or disc problems?*.

Type of treatment for chronic LBP was obtained from the following question: *What do you do for your back problem?*. Possible answers included both treatments prescribed by health professionals and self-treatment based on the following options: 1. Exercise or physical therapy; 2. use of medication or injections; 3. Acupuncture; and 4. Other (please specify). The interviewee was allowed to select more than one answer. For the purposes of comparison, the answers were grouped as follows: not carrying out any treatment; only medication; only physical therapy/exercise; medication and physical therapy/exercise; and only acupuncture or others.

The demographic variables used for the analysis were: sex (male, female) and age (18 to 49 years, 50 to 59 years, and 60 years and over). The socioeconomic variables were: education level (no education, partially completed primary education, completed primary education, completed secondary education, higher education); skin color/race (white, brown, black, yellow, or indigenous); and social class, based on the Brazilian Association of Market Research Companies classification (D/E, B, A/B)[22]. The health status variables were: self-reported health (very poor or poor, moderate, good, very good); degree of functional limitation due to chronic LBP (very high or high, moderate, low, no limitation), depression (depression, no depression); and number of chronic comorbidities (one, two, or three or more). The

variables related to access to health services were: household covered by the Family Health Strategy (FHS) (yes, no) and private health insurance (yes, no). The geographical variables were: region (North, Northeast, Southeast, South, and Center-West) and place of residence (urban, rural).

Statistical analysis

The data was analyzed using descriptive statistics: prevalence of chronic LBP and percentage distribution of type of treatment by demographic, socioeconomic, and geographical characteristics, health status, access to health services, and degree of functional limitation.

Logistic regression was performed to determine the strength of association between the dependent variables (use of some kind of treatment, physical therapy/exercise use, and medication use) and independent variables using odds ratios (OR) and 95% confidence interval (CI95%). Associations were tested between each of these three outcomes and the following independent variables: sex, age, education level, race/skin color, social class, self-reported health, depression, comorbidity, degree of functional limitation due to chronic LBP, FHS coverage, health insurance, place of residence, and region. Crude odds ratios (bivariate) were calculated for the three outcomes and adjusted odds ratios (multivariate) for the two final outcomes for each independent variable.

Since a multi-stage cluster sampling design was used, all analyses were performed using the complex samples options of the statistical software package Statistical Package for the Social Sciences (IBM SPSS 22).

Results

The prevalence of chronic LBP in Brazil is 18.5% (CI95% 17.8-19.1) (n = 11,118). This rate varies according to demographic, socioeconomic, health status, access to health services, and geographic characteristics. Prevalence of chronic LBP is higher in women than in men (21.1 CI95% 20.2-21.9 and 15.5 CI 95% 14.8-16.4, respectively). Prevalence was also shown to increase gradually with age, reaching up to 28.1% (CI95% 26.6-29.7) in older persons. Prevalence of chronic LBP was higher among people with low socioeconomic status and poor health status (Table 1).

Table 2 shows treatment use among individu-

Table 1. Characteristics of the population aged 18 years and over and prevalence and distribution of chronic LBP by demographic, socioeconomic, health status, access to health services, and geographical characteristics. Brazil, 2013.

	Sample		Chronic LBP		
	%	n	Chronic LBP Prevalence	CI 95%	IC 95%
Total sample	60202	100.0	11118	18.5	17.8 - 19.1
Total Brazilian population	146308458	100.0	27021122	18.5	-
Demographic variables					
Sex					
Male	28357	47.1	4408	15.5	14.8 - 16.4
Female	31845	52.9	6711	21.1	20.2 - 21.9
Age					
18-49	39594	65.8	5517	13.9	13.3 - 14.6
50-59	9742	16.2	2548	26.2	24.6 - 27.8
60 and over	10866	18.0	3053	28.1	26.6 - 29.7
Socioeconomic variables					
Education level					
Without education	8240	13.7	2109	25.6	23.9 - 27.4
Primary incomplete	15198	25.2	3651	24.0	22.8 - 25.3
Primary complete	9347	15.5	1476	15.8	14.5 - 17.2
Secondary complete	16878	28.0	2405	14.2	13.3 - 15.2
Higher education	10539	17.5	1478	14.0	12.8 - 15.3
Race/skin color					
Non-white	31629	52.5	5613	17.7	17.0 - 18.6
White	28573	47.5	5505	19.3	18.4 - 20.2
Social class					
D/E	14085	23.4	3106	22.1	20.7 - 23.4
C	25738	42.8	4787	18.6	17.8 - 19.5
A/B	20379	33.9	3226	15.8	14.8 - 16.9
Health status					
Self-reported health					
Poor or very poor	3506	5.8	1540	43.9	41.1 - 46.8
Moderate	16887	28.0	4790	28.4	27.1 - 29.7
Good	31801	52.8	4114	12.9	12.3 - 13.7
Very good	8008	13.3	674	8.4	7.4 - 9.6
Depression					
No	46292	76.9	9310	16.7	16.1 - 17.4
Yes	13910	23.1	1808	39.3	36.9 - 41.8
Comorbidities					
None	39045	64.9	5024	12.9	12.2 - 13.5
1 disease	14082	23.4	3464	24.6	23.3 - 25.9
2 diseases	5052	8.4	1685	33.4	30.9 - 35.9
3 or more diseases	2023	3.4	946	46.8	42.9 - 50.6
Access to health services					
Household covered by the FHS					
Yes	32875	54.6	6477	19.7	18.8 - 20.6
No	20826	34.6	3515	16.9	15.9 - 17.9
Don't know	6502	10.8	1126	17.3	15.9 - 18.9
Health insurance					
Yes	18217	30.3	3316	18.2	17.1 - 19.4
No	41985	69.7	7803	18.6	17.9 - 19.3

it continues

Table 1. Characteristics of the population aged 18 years and over and prevalence and distribution of chronic LBP by demographic, socioeconomic, health status, access to health services, and geographical characteristics. Brazil, 2013.

	Sample		Chronic LBP		
	%	n	Chronic LBP Prevalence	CI 95%	IC 95%
Geographical variables					
Region					
North	4479	7.4	755	16.9	15.3 - 18.6
Northeast	16026	26.6	3071	19.2	18.1 - 20.3
Southeast	26365	43.8	4469	16.9	15.9 - 18.0
South	8898	14.8	2076	23.3	21.6 -25.2
Center-West	4434	7.4	748	16.9	15.7 - 18.1
Place of residence					
Rural	8302	13.8	1771	21.3	19.6 - 23.1
Urban	51900	86.2	9348	18.0	17.3 - 18.7

Source: 2013 National Health Survey (NHS).

als with chronic LBP, revealing that almost half of the sample (46.4%) did not use any kind of treatment. This proportion was slightly higher among men than women (50.6% compared to 43.6%, respectively) and women were 1.3 times more likely than men to use some kind of treatment.

People with higher socioeconomic status and poorer health status were more likely to use some kind of treatment. Having a higher education level and being in social class A or B increased the likelihood of using some kind of treatment by 31% (OR 1.31 CI95% 1.05 – 1.64) and 24% (OR 1.24 CI95% 1.05 – 1.47), respectively. Poor self-reported health, depression, having various comorbidities, and having a very high or high degree of functional limitation also increased the likelihood of using some kind of treatment.

Overall, the most common treatment was medication use (40%), with or without the use of other interventions. The overall prevalence of medication use without physical therapy/exercise was 31.6%, with little variation according to sex and age. The prevalence of medication use without physical therapy/exercise was higher in the following groups: people without any education (40%), people with social class D/E (38.5%), non-whites (33.5%), people with poor or very poor self-reported health (43.4%), people with depression (34.8%), people with more than three comorbidities (38.9%), people with a very high or high degree of functional limitation (47.4%), people without health insurance (35%), people

in households covered by the FHS (34.1%), people living in rural areas (39%), and people living in the north, northeast, and center-west regions (34.2%, 35.8%, and 34.5, respectively).

The second most common treatment was physical therapy/exercise (18.8%). The prevalence of physical therapy/exercise without medication use was 10.4%. The prevalence of only physical therapy/exercise was higher among people with a higher education level (ranging from 4.5% in people without education to 23.1% in those with higher education), people in social class A/B (17.8%), whites (12.6%), people with good self-reported health (20.4%), and people with health insurance (17.9%).

The overall prevalence of medication and physical therapy/exercise was 8.4%. This rate was higher in women than in men (10.1% compared to 5.9%, respectively), people with higher education (10.6%), and those in social class A/B (11.4%), and slightly higher in whites (9.4%) in comparison to non-whites (7.5%).

The prevalence of medication and physical therapy/exercise was also higher in people with poorer health status (9.7% in people with poor or very poor self-reported health, 12.7% in people with depression, 12.5% in people with three or more comorbidities, and 12.9% in people with a high or very high degree of functional limitation). With regard to access to health services, the prevalence of the medication and physical therapy/exercise was 9% in people living in house-

Table 2. Types of treatment for chronic LBP and likelihood (odds ratio) of use of some kind of treatment by demographic, socioeconomic, health status, access to health services, and geographical characteristics. Brazil, 2013.

		Types of treatment					Likelihood of using some kind of treatment	
		Not carrying out any treatment	Only medication	Only physical therapy/ exercise	Medication and physical therapy/ exercise	Only acupuncture or others	Crude OR	CI
Total		46.4	31.6	10.4	8.4	3.2	-	-
Demographic variables								
Sex								
	Male	50.6	30.6	9.2	5.9	3.7	1	-
	Female	43.6	32.2	11.2	10.1	2.9	1.32	1.16 - 1.51
Age								
18-49		49.4	30.2	9.8	7.4	3.2	1	-
	50-59	42.9	33.0	10.7	10.3	3.2	1.30	1.10 - 1.53
	60 and over	43.9	32.8	11.3	8.7	3.4	1.25	1.08 - 1.45
Socioeconomic variables								
Education level								
	Without education	47.2	40.0	4.5	6.5	1.8	1	-
	Primary incomplete	44.8	35.7	7.9	8.1	3.5	1.11	0.93 - 1.31
	Primary complete	49.4	29.2	9.5	9.3	2.6	0.92	0.73 - 1.15
	Secondary complete	49.8	26.1	12.1	8.8	3.1	0.90	0.74 - 1.10
	Higher education	40.5	20.5	23.1	10.6	5.3	1.31	1.05 - 1.64
Race/skin color								
	Non-white	48.0	33.5	8.3	7.5	2.7	1	-
	White	44.7	29.5	12.6	9.4	3.8	0.87	0.76 - 1.00
Social class								
D/E		48.4	38.5	4.5	5.7	2.8	1	-
	C	47.3	32.6	9.3	8.2	2.7	1.05	0.90 - 1.22
	A/B	43.1	23.3	17.8	11.4	4.4	1.24	1.05 - 1.47
Health status								
Self-reported health								
	Poor or very poor	39.3	43.4	5.4	9.7	2.1	1	-
	Moderate	43.2	35.5	8.7	9.3	3.3	0.85	0.70 - 1.03
	Good	51.7	24.6	12.6	7.7	3.4	0.61	0.50 - 0.73
	Very good	52.2	19.0	20.4	4.0	4.5	0.60	0.44 - 0.81
Depression								
	No	47.8	30.9	10.5	7.6	3.1	1	-
	Yes	39.0	34.8	9.9	12.7	3.6	1.44	1.21 - 1.71
Comorbidities								
	None	50.4	29.3	9.7	7.3	3.3	1	-
	1 disease	46.8	31.3	10.9	8.0	3.0	1.15	0.99 - 1.35
	2 diseases	39.5	34.8	12.0	10.4	3.2	1.56	1.30 - 1.86
	3 or more diseases	35.7	38.9	9.6	12.5	3.3	1.83	1.42 - 2.37

Tabela 2. Proporção da utilização dos tipos de tratamento para PCC e razão de chance (odds) de realização de algum tratamento, segundo caracteristicas demográficas, socioeconômicas, condições de saúde, acesso a serviços de saúde e contextuais . Brasil, 2013.

	Types of treatment					Likelihood of using some kind of treatment	
	Not carrying out any treatment	Only medication	Only physical therapy/ exercise	Medication and physical therapy/ exercise	Only acupuncture or others	Crude OR	CI
Degree of functional limitation due to chronic LBP							
No limitation	57.6	20.7	13.0	4.5	4.3	1	-
Low degree	45.5	31.5	11.4	8.5	3.1	1.63	1.37 - 1.93
Moderate degree	40.8	36.9	8.4	11.4	2.6	1.97	1.62 - 2.39
High of very high degree	32.1	47.4	5.6	12.9	2.0	2.87	2.32 - 3.55
Access to health services							
Household covered by the FHS							
Yes	45.8	34.1	8.6	9.0	2.5	1	-
No	46.9	27.6	13.2	8.1	4.2	0.96	0.83 - 1.10
Don't know	48.1	29.3	12.3	6.2	4.1	0.91	0.74 - 1.13
Health insurance							
Yes	43.8	23.4	17.9	10.5	4.5	1	-
No	47.5	35.0	7.2	7.6	2.7	1.16	1.00 - 1.35
Geographical variables							
Region							
North	45.9	34.2	9.1	6.2	4.5	1	-
Northeast	49.0	35.8	6.7	5.9	2.5	0.88	0.72 - 1.08
Southeast	48.0	27.7	12.0	8.8	3.5	0.92	0.75 - 1.13
South	41.6	31.5	12.5	11.0	3.4	1.19	0.95 - 1.49
Center-West	39.7	34.5	11.5	11.6	2.6	1.29	1.01 - 1.64
Place of residence							
Rural	48.0	39.0	5.0	4.9	3.2	1	-
Urban	46.1	30.1	11.4	9.1	3.2	1.08	0.94 - 1.25

Source: 2013 National Health Survey (NHS).

holds covered by the FHS and 10.5% in people with health insurance. Prevalence also varied according to region, being lower in the north and northeast regions.

The least common treatment was only acupuncture and others (3.2%), with only slight differences according demographic characteristics. This type of treatment was more common among people with higher education (5.3%), people in social class A/B (4.4%), and whites (3.8%). Prevalence was also higher in people with very good self-reported health (4.5%), people without functional limitations (4.3%), people with insurance (4.5% compared to 2.7% in people without insurance), and households covered

by the FHS (4.2% compared to 2.5% in people from households that were not registered), showing that health status and access to healthcare services had a positive impact on the use of this treatment. The northeast and center-west regions showed the lowest prevalence rates for this type of treatment (2.5% and 2.6%, respectively).

The results from the logistic regression presented in Table 2 show that women were more likely to use some kind of treatment than men (OR 1.32 CI95% 1.16-1.51). People in the 50 to 59 years and 60 years and over age groups were more likely to use some kind of treatment than those in the 18 to 49 year group (30%; OR 1.30 IC 1.10-1.53 and 25%; OR 1.25 CI95%1.08 -1.45,

respectively). The use of some kind of treatment increased with increasing socioeconomic status, with people with higher education being 1.31 times more likely than those without education (OR 1.31 CI95% 1.05 – 1.64) and people in social class A/B 1.24 times more likely than those in class D/E (OR 1.24 CI95% 1.05 – 1.47).

Poor health status increased the likelihood of using some kind of treatment. The variable that showed the strongest correlation was degree of functional limitation, where people with a high or very high level of limitation were almost 3 times more likely to use some kind of treatment (OR 2.87 CI95% 2.32 – 3.55). No correlation was found between access to health services and region and the likelihood of using some kind of treatment.

Table 3 shows the crude and adjusted odds ratios for the two most common types of treatment (medication use and physical therapy/exercise use). In the crude model, women were 1.27 times more likely to use medications (OR 1.27 CI95%1.11 – 1.45) and 1.95 times more likely to use physical therapy/exercise than men (OR 1.95 CI95%1.66 - 2.30). The same relationship, albeit weaker, was maintained in the adjusted model, where women were 1.2 times more likely to use medication (OR 1.20 CI95%1.04 – 1.38) and 1.37 times more likely to physical therapy/exercise (OR 1.37 CI95%1.13 – 1.66).

The likelihood of doing physical therapy/exercise increased with age. In the crude model, people in the 60 years and over age group were 2.42 times more likely to do physical therapy/exercise (2.42 CI95% 2.05 – 2.86) than the 18 to 49 years group. This association was maintained in the adjusted model, where the 60 years and over age group was 1.42 times more likely to do physical therapy/exercise (OR 1.42 CI95% 1.13 – 1.80) than the 18 to 49 years group. There was no significant association between age and use of medication (Table 4).

Socioeconomic inequality has a greater effect on physical therapy/exercise use than on medication use. In the crude model, people with higher education were 1.7 times more likely to do physical therapy/exercise (CI95% 1.29 – 2.27). This effect was even more pronounced in the adjusted model, were people in this group are 2.39 times more likely to do physical therapy/exercise (OR 2.39 CI95% 1.63 – 3.49). There was no significant association between education level and medication use.

With regard to social class, in the adjusted model people in social class A/B were 1.96 times more likely to do physical therapy (OR 1.96 CI95% 1.43 – 2.69) than classes D/E. This association was not found for use of medication. Skin color was associated with physical therapy/exercise in the crude model (OR 1.54 CI95% 1.31 – 1.81); however, this association lost its significance in the adjusted model.

With respect to health status, no association was found between self-reported health, having depression, having comorbidities, and degree of functional limitation and physical therapy/exercise. However, the findings show that having better self-reported health reduced the likelihood of medication use. People with very good self-reported health were 1.55 times less likely to use medications than those with poor self-reported health (OR 0.55 CI95% 0.38-0.80) in the adjusted model. Degree of functional limitation showed a strong positive association with medication use in both models. People with a high or very high degree of functional limitation were 3.5 times more likely to use medications in the adjusted model. Having depression and comorbidities was associated with medication use in the crude model; however, this association lost its significance in the adjusted model.

With regard to access to health services, living in a household covered by the FHS was associated with medication use in the crude model; however, this association lost its significance in the adjusted model. There was no significant association between this characteristic and physical therapy/exercise. Having health insurance was associated with physical therapy/exercise in both models (OR 1.44 CI95% 1.15 – 1.80).

No association was found between medication and physical therapy/exercise and region. However, people living in urban areas were more likely to do physical therapy/exercise than those in rural areas in the crude model (OR 1.80 CI95% 1.44 – 2.24). This association was maintained in the adjusted model (OR 1.46 CI95% 1.13 – 1.87).

Discussion

The findings show that the most commonly used treatments for chronic LBP in Brazil are physical therapy/exercise and use of medication. Almost half of people with chronic LBP (46.4%) do not use any kind of treatment, which is a large proportion compared with other countries. In this respect, a study conducted in North Carolina reported that 20% individuals with back problems did not seek treatment[23].

Table 3. Likelihood (odds ratio) of medication use and physical therapy use for chronic LBP by demographic, socioeconomic, health status, access to health services, and geographical characteristics. Brazil, 2013.

		Medication use				Physical therapy use			
		Crude OR	CI 95%	Adjusted OR	CI 95%	Crude OR	CI 95%	Adjusted OR	CI 95%
Demographic variables									
Sex									
	Male	1	-	1.00		1	-	1.00	
	Female	1.27	1.11 - 1.45	1.20	1.04 - 1.38	1.95	1.66 - 2.30	1.37	1.13 - 1.66
Age									
	18 - 49	1	-	1.00		1	-	1.00	-
	50 - 59	1.27	1.07 - 1.49	1.01	0.84 - 1.21	2.36	1.91 - 2.91	1.38	1.09 - 1.74
	60 and over	1.18	1.00 - 1.38	0.89	0.73 - 1.08	2.42	2.05 - 2.86	1.42	1.13 - 1.80
Socioeconomic variables									
Education level									
	Without education	1	-	1.00		1	-	1.00	-
	Primary incomplete	0.90	0.76 - 1.07	0.91	0.75 - 1.10	1.38	1.05 - 1.82	1.26	0.95 - 1.68
	Primary complete	0.72	0.57 - 0.91	0.81	0.62 - 1.04	1.05	0.78 - 1.43	1.47	1.05 - 2.07
	Secondary complete	0.62	0.51 - 0.75	0.76	0.59 - 0.98	1.06	0.80 - 1.41	1.49	1.05 - 2.11
	Higher education	0.52	0.41 - 0.66	0.74	0.55 - 1.01	1.71	1.29 - 2.27	2.39	1.63 - 3.49
Race/skin color									
	Non-white	1	-	1.00		1	-	1.00	-
	White	1.09	0.96 - 1.24	1.04	0.89 - 1.21	1.54	1.31 - 1.81	0.98	0.80 - 1.20
Social class									
	D/E	1	-	1.00		1	-	1.00	-
	C	0.87	0.75 - 1.01	1.13	0.94 - 1.34	1.45	1.19 - 1.78	1.43	1.14 - 1.79
	A/B	0.67	0.57 - 0.80	1.22	0.94 - 1.57	2.10	1.70 - 2.58	1.96	1.43 - 2.69
Health status									
Self-reported health									
	Poor or very poor	1	-	1.00		1	-	1.00	-
	Moderate	0.72	0.60 - 0.86	0.98	0.80 - 1.20	0.76	0.58 - 0.99	1.11	0.81 - 1.51
	Good	0.42	0.35 - 0.51	0.74	0.58 - 0.93	0.38	0.29 - 0.50	1.08	0.78 - 1.51
	Very good	0.26	0.19 - 0.37	0.55	0.38 - 0.80	0.29	0.20 - 0.44	1.25	0.78 - 2.02
Depression									
	No	1	-	1.00		1	-	1.00	-
	Yes	1.44	1.22 - 1.71	1.11	0.90 - 1.38	3.11	2.58 - 3.76	0.98	0.76 - 1.27
Comorbidities									
	None	1	-	1.00		1	-	1.00	-
	1 disease	1.12	0.95 - 1.33	0.99	0.82 - 1.20	2.19	1.82 - 2.63	0.99	0.80 - 1.23
	2 diseases	1.43	1.19 - 1.72	1.10	0.88 - 1.38	3.62	2.95 - 4.45	1.20	0.92 - 1.56
	3 or more diseases	1.83	1.44 - 2.34	1.18	0.86 - 1.62	5.16	3.84 - 6.95	1.04	0.70 - 1.54

Table 3. Likelihood (odds ratio) of medication use and physical therapy use for chronic LBP by demographic, socioeconomic, health status, access to health services, and geographical characteristics. Brazil, 2013.

	Medication use				Physical therapy use			
	Crude OR	CI 95%	Adjusted OR	CI 95%	Crude OR	CI 95%	Adjusted OR	CI 95%
Degree of functional limitation due to chronic LBP								
No limitation	1	-	1.00		1	-	1.00	-
Low degree	1.98	1.67 - 2.35	1.78	1.49 - 2.12	1.18	0.95 - 1.47	1.44	1.14 - 1.81
Moderate degree	2.77	2.28 - 3.37	2.35	1.91 - 2.89	1.17	0.90 - 1.52	1.47	1.12 - 1.93
High of very high degree	4.52	3.63 - 5.63	3.53	2.78 - 4.48	1.08	0.84 - 1.37	1.48	1.14 - 1.93
Access to health services								
Household covered by the FHS								
Yes	1	-	1.00		1	-	1.00	-
No	0.73	0.64 - 0.85	0.88	0.75 - 1.02	1.05	0.88 - 1.24	0.86	0.70 - 1.06
Don't know	0.73	0.59 - 0.90	0.78	0.62 - 0.97	0.92	0.69 - 1.22	0.95	0.68 - 1.32
Health insurance								
No	1	-	1.00		1	-	1.00	-
Yes	0.69	0.59 - 0.80	0.85	0.71 - 1.03	1.93	1.63 - 2.27	1.44	1.15 - 1.80
Geographical variables								
Region								
North	1	-	1.00		1	-	1.00	-
Northeast	1.06	0.86 - 1.30	0.95	0.76 - 1.17	0.93	0.72 - 1.20	0.80	0.62 - 1.03
Southeast	0.85	0.68 - 1.05	0.86	0.68 - 1.08	1.38	1.07 - 1.78	0.99	0.76 - 1.30
South	1.09	0.87 - 1.36	0.98	0.76 - 1.27	2.18	1.64 - 2.89	1.27	0.93 - 1.74
Center-West	1.26	0.99 - 1.61	1.16	0.90 - 1.50	1.52	1.18 - 1.97	1.20	0.92 - 1.56
Place of residence								
Rural	1	-	1.00		1	-	1.00	-
Urban	0.83	0.72 - 0.96	1.02	0.87 - 1.20	1.80	1.44 - 2.24	1.46	1.13 - 1.87

Source: 2013 National Health Survey (NHS).

Although there is still no "gold standard" for chronic LBP management[15], the use of continuous treatment is widely indicated by the literature to reduce the negative impact of this condition on quality of life, avoid surgery, and lower healthcare costs[24]. Research in various countries has shown that rehabilitation focusing on exercise, education, and active patient involvement is effective in reducing functional limitations caused by chronic LBP[14,15].

Despite these recommendations, our results show that a relatively small proportion of individuals with chronic LBP seek continuous treatment such as physical therapy/exercise, corroborating the findings of a systematic review of the international literature[25]. On the other hand, the data also shows that medication use – which is generally associated with acute phases of chronic LBP – is the most commonly used treatment, which is consistent with the literature[11,26]. The preference for medication over continuous treatments such as physical therapy may be explained by the high cost of the latter and the time it takes to notice the benefits[27].

The findings also show that the likelihood of medication use increases significantly with increasing levels of functional limitation due to chronic LBP, with individuals with a high or very high level of limitation being 3.5 times more likely to use medication than those without

Table 4. Likelihood (odds ratio) of doing physical therapy/exercise as a treatment for chronic LBP by demographic, socioeconomic, health status, access to health services, and geographical characteristics. Brazil, 2013.

	Crude OR		Model 1		Model 2		Model 3		Model 4	
	OR	CI 95%	OR	CI 95%	OR	CI 95%	OR	CI 95%	OR	CI 95%
Demographic variables										
Sex										
Male	1	-	1.00		1.00	-	1.00		1.00	
Female	1.95	1.66 - 2.30	1.93	1.63 - 2.28	1.38	1.14 - 1.67	1.38	1.14 - 1.66	1.37	1.13 - 1.66
Age										
18 - 49	1	-	1.00		1.00	-	1.00	-	1.00	-
50 - 59	2.36	1.91 - 2.91	2.37	1.92 - 2.93	1.42	1.12 - 1.79	1.38	1.09 - 1.75	1.38	1.09 - 1.74
60 and over	2.42	2.05 - 2.86	2.60	2.16 - 3.12	1.50	1.20 - 1.89	1.43	1.13 - 1.81	1.42	1.13 - 1.80
Socioeconomic variables										
Education level										
Without education	1	-	1.00	-	1.00	-	1.00	-	1.00	-
Primary incomplete	1.38	1.05 - 1.82	1.34	1.02 - 1.77	1.34	1.01 - 1.77	1.31	0.99 - 1.74	1.26	0.95 - 1.68
Primary complete	1.05	0.78 - 1.43	1.18	0.85 - 1.63	1.60	1.14 - 2.25	1.55	1.10 - 2.17	1.47	1.05 - 2.07
Secondary complete	1.06	0.80 - 1.41	1.03	0.74 - 1.43	1.58	1.12 - 2.22	1.50	1.06 - 2.12	1.49	1.05 - 2.11
Higher education	1.71	1.29 - 2.27	1.35	0.95 - 1.92	2.63	1.81 - 3.81	2.38	1.63 - 3.47	2.39	1.63 - 3.49
Race/skin color										
Non-white	1	-	1.00	-		-	1.00	-	1.00	-
White	1.54	1.31 - 1.81	1.20	1.01 - 1.43	1.08	0.90 - 1.30	1.06	0.88 - 1.28	0.98	0.80 - 1.20
Social class										
D/E	1	-	1.00	-	1.00	-	1.00	-	1.00	-
C	1.45	1.19 - 1.78	1.59	1.29 - 1.97	1.64	1.32 - 2.05	1.58	1.26 - 1.98	1.43	1.14 - 1.79
A/B	2.10	1.70 - 2.58	2.26	1.70 - 2.99	2.48	1.83 - 3.37	2.24	1.63 - 3.07	1.96	1.43 - 2.69
Health status										
Self-reported health										
Poor or very poor	1	-	-		1.00	-	1.00	-	1.00	-
Moderate	0.76	0.58 - 0.99			1.17	0.84 - 1.63	1.13	0.83 - 1.53	1.11	0.81 - 1.51
Good	0.38	0.29 - 0.50			1.39	0.87 - 2.22	1.13	0.81 - 1.57	1.08	0.78 - 1.51
Very good	0.29	0.20 - 0.44			1.14	0.84 - 1.55	1.33	0.83 - 2.15	1.25	0.78 - 2.02
Depression										
No	1	-	-		1.00	-	1.00	-	1.00	-
Yes	3.11	2.58 - 3.76			0.99	0.77 - 1.28	1.01	0.78 - 1.30	0.98	0.76 - 1.27
Comorbidities										
None	1	-	-		1.00	-	1.00	-	1.00	-
1 disease	2.19	1.82 - 2.63			1.03	0.83 - 1.28	1.02	0.82 - 1.26	0.99	0.80 - 1.23
2 diseases	3.62	2.95 - 4.45			1.26	0.97 - 1.65	1.24	0.95 - 1.61	1.20	0.92 - 1.56
3 or more diseases	5.16	3.84 - 6.95			1.16	0.78 - 1.71	1.11	0.75 - 1.65	1.04	0.70 - 1.54
Degree of functional limitation due to chronic LBP										
No limitation	1	-	-		1.00	-	1.00	-	1.00	-
Low degree	1.18	0.95 - 1.47			1.42	1.13 - 1.79	1.44	1.15 - 1.82	1.44	1.14 - 1.81
Moderate degree	1.17	0.90 - 1.52			1.45	1.11 - 1.90	1.46	1.11 - 1.92	1.47	1.12 - 1.93
High of very high degree	1.08	0.84 - 1.37			1.47	1.13 - 1.92	1.50	1.15 - 1.95	1.48	1.14 - 1.93

Tabela 4. Razão de chance (odds) de fazer fisioterapia/exercícios para tratamento de PCC segundo características demográficas, socioeconômicas, condições de saúde, acesso a serviços de saúde e contextuais. Brasil, 2013.

	Crude OR		Model 1		Model 2		Model 3		Model 4	
	OR	CI 95%	OR	CI 95%	OR	CI 95%	OR	CI 95%	OR	CI 95%
Access to health services										
Household covered by the FHS										
Yes	1	-	-		-	-	1.00	-	1.00	-
No	1.05	0.88 - 1.24				-	0.87	0.71 - 1.06	0.86	0.70 - 1.06
Don't know	0.92	0.69 - 1.22				-	0.94	0.68 - 1.31	0.95	0.68 - 1.32
Health insurance										
No	1	-	-		-	-	1.00	-	1.00	-
Yes	1.93	1.63 - 2.27				-	1.48	1.18 - 1.85	1.44	1.15 - 1.80
Geographical variables										
Region										
North	1	-	-		-	-	-		1.00	-
Northeast	0.93	0.72 - 1.20				-			0.80	0.62 - 1.03
Southeast	1.38	1.07 - 1.78				-			0.99	0.76 - 1.30
South	2.18	1.64 - 2.89				-			1.27	0.93 - 1.74
Center-West	1.52	1.18 - 1.97				-			1.20	0.92 - 1.56
Place of residence										
Rural	1	-	-		-	-	-		1.00	-
Urban	1.80	1.44 - 2.24				-			1.46	1.13 - 1.87

Model 1: Adjusted for demographic and socioeconomic variables. Model 2: Adjusted for demographic, socioeconomic, and health status variables. Model 3: Adjusted for demographic, socioeconomic, health status, and access to health services variables. Model 4: Adjusted for demographic, socioeconomic, health status, access to health services, and geographical variables.
Source: 2013 National Health Survey (NHS).

limitation. Despite the high level of medication use, the NHS does not provide information on the types of medications used or whether they were prescribed by a doctor. A study conducted in the United States covering the period 1999 to 2010 showed that the most commonly used medications were narcotics, benzodiazepines, and muscle relaxants[24], while a systematic review of chronic LBP in Africa showed that the most widely used medications were analgesics[16].

While Krismer and Van Tulder[11] points out that there is evidence to support the use of simple analgesics, nonsteroidal anti-inflammatory drugs, and muscle relaxants to relieve back pain, a study conducted by Martell et al.[28] covering the period 1966 and 2005 reported that the indiscriminate use of opioids commonly prescribed for the short-term relief of chronic LBP is a serious public health problem. This finding supports the above theory explaining low adherence to medium and long-term treatments.

Our findings also show that individuals with functional limitations are more likely to use physical therapy, as shown by a study conducted in Canada[17]. However, the degree of functional limitation does not influence the likelihood of using this type of intervention. Despite being considered more expensive, physical therapy can reduce time spent in hospitals and therefore treatment costs[29].

In the present study, people with higher education and in social class A/B were more likely to use physical therapy. These findings are similar to those of a population-based study conducted by Freburger North Carolina[30] showing that education level and income were enabling characteristics associated with physical therapy use. A population-based study conducted in Pelotas/RS (n = 3,100)[29] also showed that higher social class was associated with physical therapy use, yet failed to demonstrate a significant association with education level. The association between

high education level and physical therapy use found by this study may have been influenced by higher education levels among individuals in higher social classes.

Type of treatment is associated with socioeconomic status, which includes social class and income. The present study showed that race was not a statistically significant predictor of dependent variables. Other studies have also shown that care-seeking for chronic LBP is similar between races[31]. Furthermore, in accordance with the literature, the findings of the present study show that individuals with health insurance were more likely to see a physical therapist[30]. Physical therapy use is also influenced by the relationship between having health insurance and income/social class.

Despite the fact that studies have shown improvements in access to health services in Brazil[32,33], this study revealed that the use of some kind of treatment was lower among vulnerable population groups with low social class. With respect to sex, our study shows that women are more likely to seek treatment than men. These findings are similar to those reported by Carey in a study using a representative sample of households in North Carolina[23]. The same study showed that care seeking was greater among individuals with high pain scores and poor functional status, as observed by the present study.

In Brazil, representative data on access to health services, medical appointments, and treatment for chronic LBP is scarce. Since the frequency of hospital admission for this condition is low, health information systems do not provide adequate information for epidemiological studies. The advantage of household health surveys is that they are representative and also consider individuals who do not seek health services. It is vital that studies addressing treatment of chronic LBP use a combination of both formal and informal data sources, since informal interventions such as physical activity can often be more effective than traditional practices like physical therapy and chiropraxy[34]. Furthermore, common practices such as self-medication cannot be observed in hospital records.

The NHS is the first nationally representative health survey in Brazil to include questions on types of treatment for chronic LBP, disease duration, and age at onset of functional limitations. The questions on treatment encompass both therapies indicated by health professionals and self-treatment (exercise or physical therapy, medications or injections, acupuncture and others). However, the survey has certain limitations, such as the categorization of types of intervention. In this respect, the NHS does not separate physical therapy and exercise, the latter of which is widely recommended in the literature for the prevention of chronic LBP.

With respect to the use of medication/injections, the NHS does not provide information on the type of medications used or whether they were prescribed by a doctor, preventing the study of self-medication. Another limitation is that the survey only captures information on people undergoing treatment for chronic LBP at the time of the interview, ignoring previous treatment and its duration, meaning that it is not possible to analyze treatment continuity and make comparisons with occasional interventions, which is central to the discussion of chronic LBP treatment.

Studies show that consultation with a doctor or other health professional is common among people with chronic LBP[23,35,36]. A systematic review of the prevalence of low back pain in Africa showed that doctors were the most commonly consulted health professionals for this condition[16], while other international studies have shown that chiropraxy is a common treatment[35,37]. However, this type of treatment was not considered separately by the NHS, preventing comparisons with other studies.

Conclusion

The findings show that the use of continuous treatments such as physical therapy for chronic LBP is strongly associated with socioeconomic status. No association was found between socioeconomic status and medication use. However, lower health status is associated with increased use of medications.

Collaborations

DE Romero and J Muzy participated in study conception and design, data analysis and interpretation, and in the drafting of this manuscript. L Maia and AP Marques participated in data analysis and interpretation and in the drafting of this manuscript. PRB Borges participated in data analysis and interpretation. D Castanheira participated in data interpretation and the drafting of this manuscript.

References

1. GBD 2016 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 328 diseases and injuries for 195 countries, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. *Lancet.* 2017; 390(10100):1211-1259.

2. Oliveira MM, Andrade SSCDA, Souza CAV, Ponte JN, Szwarcwald CL, Malta DC. Problema crônico de coluna e diagnóstico de distúrbios osteomusculares relacionados ao trabalho (DORT) autorreferidos no Brasil: Pesquisa Nacional de Saúde, 2013. *Epidemiol e Serviços Saúde.* 2015; 24(2):287-296.

3. Malta DC, Stopa SR, Szwarcwald CL, Gomes NL, Silva Júnior JB, Reis AAC. A vigilância e o monitoramento das principais doenças crônicas não transmissíveis no Brasil - Pesquisa Nacional de Saúde, 2013. *Rev Bras Epidemiol* 2015; 18(Supl. 2):3-16.

4. Romero D, Santana D, Borges P, Marques A, Castanheira D, Rodrigues JM, Sabbadini L. Prevalência, fatores associados e limitações relacionados ao problema crônico de coluna entre adultos e idosos no Brasil. *Cad Saude Publica* 2017; 34(2):e00012817.

5. Meucci RD, Fassa AG, Faria NMX. Prevalence of chronic low back pain: systematic review. *Rev Saude Publica.* 2015; 49.

6. Hoy D, Brooks P, Blyth F, Buchbinder R. The Epidemiology of low back pain. *Best Pr Res Clin Rheumatol* 2010; 24:769-781.

7. Manek NJ, MacGregor AJ. Epidemiology of back disorders: prevalence, risk factors, and prognosis. *Curr Opin Intern Med* 2005; 4(April):324-330.

8. Meziat Filho N, Silva GA. Invalidez por dor nas costas entre segurados da Previdência Social do Brasil. *Rev Saude Publica* 2011; 45(3):494-502.

9. Gouveia M, Augusto M. Custos indirectos da dor crónica em Portugal. *Rev Port Saúde Pública.* 2011; 29(2):100-107.

10. Deyo RA, Mirza SK, Turner JA, Martin BI. Overtreating Chronic Back Pain: Time to Back Off? *Fam Med Heal CARE Syst .* 2009; 22(1):62-68.

11. Krismer M, van Tulder M. Low back pain (non-specific). *Best Pract Res Clin Rheumatol* 2007; 21(1):77-91.

12. Carey TS, Freburger JK. Exercise and the prevention of low back pain: Ready for implementation. *JAMA Intern Med* 2016; 176(2):208-209.

13. Organização Pan-Americana de Saúde (OPAS). Prevenção de doenças crônicas, um investimento vital. Brasília: OPAS; 2005.

14. Scascighini L, Toma V, Dober-Spielmann S, Sprott H. Multidisciplinary treatment for chronic pain: a systematic review of interventions and outcomes. *Rheumatology* 2008; 47(5):670-678.

15. Oliveira IO, Pinto LLS, Oliveira MA, Côra M. McKenzie method for low back pain. *Rev Dor* 2016; 17(4):303-306.

16. Louw QA, Morris LD, Grimmer-Somers K. The Prevalence of low back pain in Africa: a systematic review. *BMC Musculoskelet Disord* 2007; 8:105.

17. Lim K-L, Jacobs P, Klarenbach S. A Population-Based Analysis of Healthcare Utilization of Persons With Back Disorders. *Spine (Phila Pa 1976)* 2006; 31(2):212-218.

18. Ferreira GD, Silva MC, Rombaldi AJ, Wrege ED, Siqueira FV, Hallal PC. Prevalência de dor nas costas e fatores associados em adultos do sul do Brasil: estudo de base populacional. *Brazilian J Phys Ther* 2011; 15:31-36.

19. Amorim JSC, Silva SLA, Pereira LSM, Dias RC. Acesso aos serviços de fisioterapia e sua utilização por idosos com dor lombar. *ConScientiae Saúde.* 2014; 12(4):528-535.

20. Souza-Júnior PRB, Freitas MPS, Antonaci GDA, Szwarcwald CL. Desenho da amostra da Pesquisa Nacional de Saúde 2013. *Epidemiol e Serviços Saúde* 2015; 24(2):207-216.

21. Szwarcwald CL, Malta DC, Pereira CA, Vieira MLFP, Conde WL, Souza Júnior PRB, Damacena GN, Azevedo LO, Azevedo e Silva G, Theme Filha MM, Lopes CS, Romero DE, Almeida WS, Monteiro CA. Pesquisa Nacional de Saúde no Brasil: concepção e metodologia de aplicação. *Cien Saude Colet* 2014; 19(2):333-342.

22. Associação Brasileira de Empresas de Pesquisa (ABEP). *Critério Brasil.* São Paulo: ABEP; 2013.

23. Carey TS, Freburger JK, Holmes GM, Castel L, Darter J, Agans R, Kalsbeek W, Jackman A. A Long Way to Go. *Spine (Phila Pa 1976)* 2009; 34(7):718-724.

24. Mafi JN, McCarthy EP, Davis RB, Landon BE. Worsening trends in the management and treatment of back pain. *JAMA Intern Med* 2013; 173(17):1573-1581.

25. Balagué F, Mannion AF, Pellisé F, Cedraschi C. Non-specific low back pain. *Lancet* 2012; 379(9814):482-491.

26. Figueiredo VF, Pereira LSM, Ferreira PH, Pereira ADM, Amorim JSC. Incapacidade funcional, sintomas depressivos e dor lombar em idosos. *Fisioter em Mov* 2013; 26(Dl):549-557.

27. Wieser S, Horisberger B, Schmidhauser S, Eisenring C, Brügger U, Ruckstuhl A, Dietrich J, Mannion AF, Elfering A, Tamcan O, Müller U. Cost of low back pain in Switzerland in 2005. *Eur J Heal Econ* 2011; 12(5):455-467.

28. Martell BA, O'Connor PG, Kerns RD, Becker WC, Morales KH, Kosten TR, Fiellin DA. Systematic Review: Opioid Treatment for Chronic Back Pain: Prevalence, Efficacy, and Association with Addiction. *Ann Intern Med* 2007; 146(2):116.

29. Siqueira FV, Facchini LA, Hallal PC. Epidemiology of physiotherapy utilization among adults and elderly. *Rev Saude Publica.* 2005; 39(4):662-668.

30. Freburger JK, Carey TS, Holmes GM. Physical Therapy for Chronic Low Back Pain in North Carolina: Overuse, Underuse, or Misuse? *Phys Ther* 2011; 91(4):484-495.

31. Carey TS, Freburger JK, Holmes GM, Knauer S, Wallace A, Darter J. Race, care seeking and utilization for chronic back and neck pain: population perspectives. *J Pain* 2011; 11(4):343-350.

32. Viacava F, Bellido JG. Condições de saúde, acesso a serviços e fontes de pagamento, segundo inquéritos domiciliares. *Cien Saude Colet* 2016; 21(2):351-370.

33. Andrade MV, Noronha KVMS, Menezes RM, Souza MN, Reis CB, Martins DR, Gomes L. Desigualdade socioeconômica no acesso aos serviços de saúde no Brasil: um estudo comparativo entre as regiões brasileiras em 1998 e 2008. *Econ Apl* 2013; 17(4):623-645.

34. Jacobs P, Schopflocher D, Klarenbach S, Golmohammadi K, Ohinmaa A. A health production function for persons with back problems: results from the Canadian Community Health Survey of 2000. *Spine (Phila Pa 1976)* 2004; 29(20):2304-2308.

35. Côté P, Cassidy JD, Carroll L. The treatment of neck and low back pain: who seeks care? who goes where? *Med Care* 2001; 39(9):956-967.

36. Picavet HSJ, Struijs J, Westert G. Utilization of Health Resources due to Low Back Pain: Survey and Registered Data Compared. *Spine (Phila Pa 1976)* 2008; 33(4):436-444.

37. Kent PM, Keating JL. The epidemiology of low back pain in primary care. *Chiropr Osteopat*. 2005; 13:13.