

# Prevalence of motor deficiencies and their relationship with federal expenditures for prosthesis, orthotics and other equipment in the Brazilian states in 2010

*Prevalência de deficiências motoras e sua relação com o gasto federal com próteses, órteses e outros equipamentos nos estados brasileiros em 2010*

*Prevalencia de deficiencias motoras y su relación con el gasto federal con prótesis, órtesis y otros equipos en los estados brasileños en 2010*

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**ABSTRACT** | The objective of this study was to know the prevalence of full motor difficulty (MD) (walking or climbing stairs) and according to degrees (mild, moderate, severe) in the Brazilian states and in the country; present the federal expenditures on prostheses, orthotics and materials (OPM) related to such difficulty; and verify the correlation between the prevalence of disabilities and public expenditures on OPM. Population data was used from every major city in Brazil, obtained from the IBGE website, and OPM expenditures related to MD, extracted from the DATASUS website in 2010. Data was analyzed through the prevalence of MD and OPM expenses related to MD. We used the Stata 11 software for the implementation of the Spearman correlation test with a significance level of 5%. The prevalence of MD in Brazil in the year of 2010 was 6.91%; ranging from 8.63% (state of Alagoas) to 5.28% (state of Tocantins). The expenditures on OPM varied according to the state, and these expenditures were proportional to the prevalence of MD in the cities of the states of Acre and Piauí (orthotics); Pernambuco (prostheses), and Acre and Maranhão (equipment). The correlation between the amount spent and the prevalence of MD was inverse in the cities of the states of Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina and São Paulo (orthotics); Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina and São Paulo (prostheses); and Espírito Santo, Minas Gerais, Rio Grande do Sul and São Paulo (equipment).

**Keywords** | Types of Physiotherapy; Health Expenses; Prevalence; Individuals with Disabilities.

**RESUMO** | O objetivo deste estudo foi conhecer a prevalência de dificuldade motora (DM) (caminhar ou subir degraus) total e segundo grau (leve, moderada, grave) nos estados brasileiros e no país; apresentar os gastos federais com próteses, órteses e equipamentos (OPM) relacionados a essa dificuldade; e verificar a existência de correlação entre as prevalências de DM e gasto público com as OPM. Foram usados dados populacionais de todas as cidades do Brasil, obtidos a partir do site do IBGE, e gastos com OPM relacionados à DM, extraídos do site do DATASUS, de 2010. Os dados foram analisados por meio de prevalências de DM e gastos com OPM relacionados à DM. Utilizou-se o programa Stata 11 para execução do teste de correlação de Spearman com nível de significância de 5%. A prevalência de DM no Brasil no ano de 2010 foi de 6,91%, variando de 8,63% (AL) a 5,28% (TO). Os gastos com OPM variaram segundo os estados e foram proporcionais à prevalência de DM nas cidades dos estados do AC e PI (órteses), PB (próteses), e AC e MA (equipamentos). A correlação entre valor investido e prevalência de DM foi inversa nas cidades dos estados de ES, MG, PR, RS, SC e SP (órteses); ES, MG, PR, RS, SC e SP (próteses); e ES, MG, RS e SP (equipamentos).

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**Descritores** | Modalidades de Fisioterapia; Gastos em Saúde; Prevalência; Pessoas com Deficiência.

**RESUMEN** | El objetivo de este estudio fue conocer la prevalencia de dificultad motora (DM) (caminar o subir escaleras) total y segundo grados (leve, moderada, severa) en los estados brasileños y en el país; presentar los gastos federales con prótesis, órtesis y equipos (OPM) relacionados con esta dificultad; y verificar la existencia de correlación entre las prevalencias de DM y el gasto público con los OPM. Se utilizaron datos de poblaciones de todas las ciudades del Brasil, obtenidos del sitio web del IBGE, y gastos con OPM relacionados a la DM, extraídos del sitio web del DATASUS, de 2010. Los datos fueron analizados por medio

de prevalencias de DM y gastos con OPM relacionados con la DM. Se utilizó el programa Stata 11 para la ejecución de la prueba de correlación de Spearman con nivel de significancia del 5%. La prevalencia de DM en Brasil en el año 2010 fue de 6,91%, variando del 8,63% (AL) hasta el 5,28% (TO). Los gastos con OPM variaron según los estados y fueron proporcionales a la prevalencia de DM en las ciudades de los estados del PI (órtesis), PB (prótesis) y AC y MA (equipos). La correlación entre el monto invertido y prevalencia de DM fue el inverso en las ciudades de los estados de ES, MG, PR, RS, SC y SP (órtesis); ES, MG, PR, RS, SC, y SP (prótesis); y ES, MG, RS y SP (equipos).

**Palabras clave** | Modalidades de Fisioterapia; Gastos en Salud; Prevalencia; Personas con Discapacidad.

## INTRODUCTION

The Brazilian public health system has principles that guarantee to the user a universal and integral service<sup>1</sup>. Thus, it is the responsibility of the State to ensure the provision of orthotics, prostheses and auxiliary means of locomotion (OPM), indicated for patients with disabilities related to mobility. The cost of OPM has a variation from BRL 33.00 for a pair of insoles up to BRL 1,200.00 for an endoskeletal prosthesis<sup>2</sup>. According to the World Health Organization (WHO), only 5% to 15% of the people who need auxiliary devices and technologies have access to them in low or medium income countries<sup>3</sup>.

In Brazil, the OPMs are distributed free of charge in rehabilitation centers, classified as high complexity services<sup>4,5</sup>. The allocation of financial resources from the Brazilian public system is based on the production of services and not in the clinical needs of the users<sup>6</sup>. This could implicate meeting the economic interests of service providers, and not the functional needs of the users, evidencing a distortion in health care.

The federal government has an investment plan for people with disabilities through the program “Viver sem Limites – Plano Nacional dos Direitos das Pessoas com Deficiências” (Living without limits – National Plan of the Rights of People with Disabilities)<sup>7</sup>. It is known that the use of assistive technologies can be decisive even for improvements on the economic profile of the population<sup>8</sup> and that the use of such equipment may have social implications and on the independence of individuals<sup>9</sup>, for their functionality would be enhanced. Besides, there are reports of occurrences of distortions in the distribution of assistive technology equipment<sup>10</sup>.

Therefore, knowing the distribution of the prevalence of motor difficulty in the Brazilian states can contribute to the planning and implementation of public health policies aimed at this population group. Studies related to the analysis of costs of OPM are found in the literature<sup>11-17</sup>, however, the literature does not advance or explore the relationship of these costs with the prevalence of motor deficiencies/difficulties and the territorial distribution of financial resources. Accordingly, the determination of the financial resources distribution intended for the payment of OPMs and its correlation with the prevalence of such difficulty can guide decisions about maintenance or reorientation of resource distribution or funding policies to these inputs in several Brazilian states.

## OBJECTIVES

The objective of this study was to know the total prevalence of motor difficulty (MD) (walking or climbing stairs) and according to mild, moderate, and severe degrees in the Brazilian states and in the country; present the federal expenses with OPMs; and verify the correlation between the prevalence of disabilities (needs) and public expenses with the OPMs.

## METHODOLOGY

Ecological study<sup>18</sup>, checking the correlations of data from all cities in Brazil, regarding population and OPMs MD-related expenditures in the year 2010. This research mode aims to generate and test etiologic

hypotheses, as well as evaluate the effectiveness of interventions in the population<sup>19</sup>.

## MATERIAL

Populational and motor difficulty (MD) data were taken from the website of the Brazilian Institute of Geography and Statistics (IBGE), 2010<sup>20</sup>. During the 2010 census the following question was made to people older than 10 years old: "Do you have permanent difficulty walking or climbing stairs? (if you use prosthesis, cane or auxiliary device, make your assessment when you are using it)" – alternatives: 1 – yes, cannot do it in any way (severe); 2 – yes, with great difficulty (moderate); 3 – yes, with some difficulty (mild); 4 – no difficulty<sup>21</sup>.

Federal expenses with OPMs in 2010 were obtained from the Computing Department of SUS (DATASUS)<sup>22</sup>, at the Outpatient Information System platform of SUS (SIA/SUS)<sup>23</sup>, which generates a registry at each procedure, equipment or input paid by the federal government to the health service providers linked to SUS.

## Research steps

The survey and data tabulation was initially conducted for the resident population in every city in the country in the year of 2010. Other numbers were added, related to the occurrence of people with MD in the same cities, in the same year. Next, the prevalence coefficient was calculated by dividing the number of people with MD by the population older than 10 years old in each city, being the total multiplied by 100. Cities with the same name have been identified by the abbreviation of the state name. At the end of this step, the coefficients were calculated for each state of the Federation in the year of 2010.

Then, data regarding the amounts spent for prosthesis, orthotics and equipment for each state in the year 2010 were added to the file.

## Statistical analysis

Descriptive analysis was performed through the prevalence of MD and expenses with prosthesis, orthotics and MD-related equipment in the Brazilian states, in current Brazilian currency. We used the Spearman test to verify the correlation between the expenses with prosthesis, orthotics and equipment with the prevalence of MD between the cities of each state of Brazil. The non-parametric nature of the data

was respected by following the directions provided by the Shapiro-Willk test. The significance level adopted was 5%.

## Results

Table 1 shows the data on prevalence of MD, investment in OPM and the correlation between that investment and the prevalence. It is verified that 6.91% of the Brazilian citizens have reported some MD; the federative units with greater MD prevalence were Alagoas (8.63%), Paraíba (8.51%) and Pernambuco (8.32%), and the ones with lower prevalence were Roraima (5.04%), Distrito Federal (5.09%) and Tocantins (5.28%).

The states of Acre and Piauí showed a significant positive correlation, indicating financial resources distribution targeted to the purchase of orthotics proportional to the coefficient of people with MD ( $p < 0.05$ ). This correlation between payment of orthotics and prevalence of MD was negative and significant ( $p < 0.05$ ) in the states of Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, and São Paulo.

Regarding the correlation between investment in prostheses and the prevalence of MD, only the state of Paraíba showed a positive correlation ( $p < 0.05$ ). For the states of Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, and São Paulo, the correlation was negative ( $p < 0.05$ ).

Acre and Maranhão have presented positive correlations ( $p < 0.05$ ) between the payment of equipment and the prevalence of MD; Espírito Santo, Minas Gerais, Rio Grande do Sul and São Paulo have presented negative correlation coefficients ( $p < 0.05$ ).

The prevalence of MD in Brazil in the year of 2010 was 6.91%; ranging in the states from 8.63% (Alagoas) to 5.28% (Tocantins). The prevalence of mild MD varied from 5.63% (Pernambuco) to 3.53% (Tocantins); the higher moderate MD was of 2.60% (Alagoas) and the lower one was of 1.38% (Rondônia); the prevalence of severe MD varied from 0.44% (Pernambuco) to 0.25% (Rondônia). The amounts spent with OPM varied according to the state, and these expenses were proportional to the prevalence of MD in the cities of the states of Acre and Piauí (investment in orthotics); Paraíba (expenses with prostheses), and Acre and Maranhão (investment in equipment). The correlation between the amount invested and the prevalence of MD was reverse in the cities of the states of Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina and São Paulo (payment of orthotics); Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina and São Paulo (prosthesis); and Espírito Santo, Minas Gerais, Rio Grande do Sul, and São Paulo (expenses on equipment).

Table 1. Distribution of the prevalence of motor difficulty (%); from the amount spent by the federal sphere with prostheses, orthotics and related equipment to the MD in currency and their correlation coefficients, according to each Brazilian state, ordered according to the total prevalence of MD (Motor Difficulty), 2010

State	Motor difficulty prevalence				Orthotics				Prostheses				Equipment			
	Mild	Moderate	Severe	Total	Amount spent (BRL)	Correlation - r (p)	Amount spent (BRL)	Correlation - r (p)	Amount spent (BRL)	Correlation - r (p)	Amount spent (BRL)	Correlation - r (p)	Amount spent (BRL)	Correlation - r (p)		
Alagoas	5.56	2.60	0.38	8.63	156,454.30	0.10 (0.2879)	502,905.30	0.18 (0.0674)	590,833.45	0.07 (0.4584)						
Paraíba	5.67	2.39	0.44	8.51	250,597.80	0.12 (0.0584)	499,173.40	0.14 (0.0328)	554,477.90	0.08 (0.1871)						
Pernambuco	5.51	2.39	0.41	8.32	1,560,841.70	0.07 (0.2915)	2,563,594.30	0.03 (0.6447)	3,144,395.21	0.08 (0.2350)						
Ceará	5.43	2.21	0.43	8.07	360,842.50	-0.13 (0.0745)	1,136,514.20	-0.09 (0.1872)	341,853.75	-0.07 (0.3032)						
Rio Grande do Norte	5.20	2.29	0.42	7.93	17,233.30	0.03 (0.6494)	30,686.40	0.04 (0.5302)	22,175.78	-0.01 (0.9679)						
Piauí	5.13	2.22	0.39	7.75	1,085,947.80	0.13 (0.0483)	2,019,309.90	0.05 (0.4322)	1,528,001.75	0.04 (0.5189)						
Rio Grande do Sul	4.98	2.24	0.41	7.65	7,995.50	-0.15 (0.0006)	1,596.00	-0.17 (0.0001)	6,287.10	-0.13 (0.0033)						
Rio de Janeiro	5.17	2.04	0.41	7.63	1,432,219.80	-0.10 (0.3431)	3,541,222.30	-0.07 (0.4601)	3,993,259.05	0.11 (0.2723)						
Bahia	4.83	1.98	0.37	7.19	837,310.50	0.01 (0.9394)	2,464,111.50	0.04 (0.3784)	3,496,836.67	0.05 (0.2361)						
Espírito Santo	4.68	2.07	0.38	7.13	113,703.80	-0.22 (0.0429)	468,151.60	-0.23 (0.0413)	901,434.00	-0.29 (0.0095)						
Minas Gerais	4.56	2.06	0.40	7.03	210,262.70	-0.10 (0.0014)	560,578.40	-0.16 (0.0001)	841,615.95	-0.14 (0.0001)						
Maranhão	4.77	1.90	0.32	7.00	183,429.50	0.05 (0.4216)	506,981.40	0.13 (0.0551)	246,494.92	0.22 (0.0010)						
Brazil	4.62	1.92	0.37	6.91	15,106,507.20	-0.10 (0.0001)	31,152,002.30	-0.12 (0.0001)	40,054,877.11	0.08 (0.0001)						
Sergipe	4.43	2.01	0.36	6.80	3,491,880.90	0.10 (0.3815)	4,900,576.70	0.01 (0.9298)	6,605,762.55	-0.01 (0.9446)						
Paraná	4.43	1.94	0.38	6.76	384,571.30	-0.15 (0.0014)	565,716.60	-0.17 (0.0006)	765,284.70	-0.07 (0.2103)						
Santa Catarina	4.34	2.01	0.35	6.70	247,300.20	-0.11 (0.0487)	1,065,947.80	-0.11 (0.0435)	410,106.96	-0.04 (0.3951)						
Pará	4.54	1.65	0.28	6.47	7,7192.00	0.01 (0.8183)	219,993.20	-0.14 (0.0888)	303,858.96	0.12 (0.1241)						
Amapá	4.51	1.64	0.28	6.44	17,309.90	0.11 (0.6930)	158,965.70	0.16 (0.5470)	157,708.78	0.11 (0.6843)						
Goiás	4.20	1.70	0.36	6.27	994,160.90	-0.05 (0.4309)	1,314,081.00	-0.06 (0.2936)	4,419,912.07	-0.02 (0.6844)						
São Paulo	4.10	1.68	0.40	6.20	14,628.90	-0.34 (0.0001)	65,028.80	-0.26 (0.0001)	20,810.20	-0.31 (0.0001)						
Acre	4.30	1.59	0.28	6.18	114,066.00	0.50 (0.0165)	272,468.10	0.24 (0.2707)	177,140.39	0.45 (0.0323)						
Mato Grosso do Sul	4.01	1.75	0.36	6.13	96,553.20	0.01 (0.9289)	584,154.50	0.11 (0.3012)	553,652.85	-0.10 (0.3602)						
Amazonas	4.31	1.45	0.26	6.02	163,835.80	-0.02 (0.8754)	525,251.00	-0.09 (0.4665)	653,228.19	0.12 (0.3306)						
Rondônia	3.74	1.38	0.25	5.38	1,153,287.30	0.08 (0.5278)	2,395,101.80	-0.05 (0.4322)	3,085,777.55	0.04 (0.7378)						
Mato Grosso	3.63	1.42	0.27	5.33	1,703,152.30	0.07 (0.3609)	3,720,433.70	0.01 (0.8776)	4,200,943.60	0.08 (0.3353)						
Tocantins	3.53	1.45	0.29	5.28	67,206.30	-0.02 (0.8099)	231,187.20	-0.07 (0.3640)	271,946.34	-0.02 (0.7401)						
Distrito Federal	3.44	1.33	0.31	5.09	189,850.00	-	370,554.30	-	1,288,196.44	-						
Roraima	3.46	1.32	0.25	5.04	174,673.00	0.30 (0.2742)	467,717.20	-0.06 (0.8266)	1,472,882.00	-0.06 (0.8213)						



## DISCUSSION

The comparison of the prevalences found in this survey with other cross-sectional studies is a difficult operation, considering the different methodologies used in data collection. Differences in the results provided by different methods of data collection have already been reported, and the need for the standardization of the process has also been evidenced<sup>24-27</sup>. WHO has made continuous efforts to raise awareness in research institutions of various countries about the importance of standardized measurement of the deficiencies<sup>28</sup>. The prevalence of MD found for Brazil in 2010 is less than the one presented by citizens older than 17 years old in the USA in 2005 (10.3%)<sup>29</sup>; lower than the one registered among middle-aged people in England in 2002 (18%)<sup>30</sup>; lower than the one found between people older than 15 years old in the Netherlands in 1998 (7.4%)<sup>31</sup>; and lower than the one checked between people over 5 years old in Spain in 2008 (10.41%)<sup>32</sup>. The higher prevalence among countries presented when compared to Brazil can be explained by the relationship between the occurrence of disabilities and age<sup>33-36</sup>; thus, the USA, England, the Netherlands, and Spain, are countries with greater life expectancy than Brazil, so the prevalence of MD would be greater among them. In addition to that, it is necessary to register that the Brazilian data may show distortions due to the under-registration of cases of people with disabilities.

The cities of the states of Acre and Piauí invested in orthotics proportional to the prevalence coefficients. In the state of Paraíba the same result related to the costs of prostheses was registered. The cities of the states of Acre and Maranhão invested in equipment proportional to the MD prevalence coefficients. Such information can allude to the issue of greater dependence on the Brazilian Unified Health System (SUS) by persons with underprivileged socio-economic characteristics, as already reported in literature<sup>37</sup>. Information regarding the Human Development Index (HDI) of the states seem to corroborate that statement, since the states of Acre, Piauí, Paraíba and Maranhão have the following indexes: 0.697; 0.656; 0.661; 0.636; according to the HDI of 2000, presented by the United Nations Program for Development (PNUD). They are ranked in the 21<sup>st</sup>, 25<sup>th</sup>, 24<sup>th</sup> and 27<sup>th</sup> positions, respectively, while Brazil has an HDI of 0.76624. On the other hand, when analyzing the states which showed negative correlation, that is, in the cities in which the coefficients were greater,

less investments were recorded, and we observed that in the states of Espírito Santo (HDI: 0.765; 11<sup>th</sup> position), Minas Gerais (HDI: 0.773; 9<sup>th</sup> position), Paraná (HDI: 0.787; 6<sup>th</sup> position), Rio Grande do Sul (HDI: 0.814; 4<sup>th</sup> position), Santa Catarina (HDI: 0.822; 2<sup>nd</sup> position) and São Paulo (HDI: 0,820; 3<sup>rd</sup> position) are located at the top end of the HDI ranking with the best rates, also in the year 2000<sup>38</sup>, which can represent greater reliance on the private sector or greater coverage of the user's own expenses with OPM. It is estimated that 24% of the population uses private health plans, and the population covered by these companies presents higher educational level<sup>39</sup> and lives in cities of medium or large size<sup>40</sup>. In addition to that, the Southeast region concentrates a larger percentage of the population covered by private health plans, 34.44% when compared to the Northeast, with 17.09%<sup>41</sup>. Another study shows that Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina and São Paulo were among the 11 states of the country with greater coverage by private health plans<sup>42</sup>. It is worth mentioning that people that use the private health network are not always more satisfied than those using SUS<sup>43</sup>. This piece of data reinforces the mistaken idea that SUS is a sub-system aimed only at the low-income population<sup>44,45</sup>, when in fact it is a universal system<sup>46</sup>. Considering the foregoing, performing studies with the OPM investment by the private sector would be of great value when measuring the needs of people with disabilities in general being met. In the research herein, only the costs of the federal public sphere were studied, however, the knowledge of the private investment in OPM should also be reviewed, since, in Brazil, the two systems can act in a complementary way to the needs of the users<sup>37</sup>. In addition to that, it is important to highlight that there are municipal and state investments in the sector.

This study presents as a limitation the fact that it deals only with federal expenses with OPM, noting that other spheres can act on the delivery of OPMs, such as the states, municipalities, nonprofit entities, and even being purchased by the user himself. Another limitation related to the design of the research is that it deals mainly with secondary data and data from different sources, so the quality in the collection of the data cannot be ensured. It must also be reported that the expenses studied herein refer only to the federal sphere; state and local expenses were not covered in this article. However, it should be considered that information from two large Brazilian databases are being used,

DATASUS and IBGE, the best ones available, even with their limitations for different studies<sup>47-48</sup>.

## CONCLUSION

The prevalence of MD in Brazil presents a variation according to the states of the Federation and the degrees of disability. In addition to that, there is no uniform relationship between the prevalence of disabilities and the public expenses with OPM. Data on the distribution of federal financial resources invested in OPM reflect inequalities in several Brazilian states, and between some Northern and Northeastern states. Thus we registered a direct proportionality between the prevalence of MD and the expense with OPM, while in the South and Southeastern states this proportionality has proved reverse, possibly the smallest dependence of the public system that occurs with increasing social-economic conditions of the population. The results can serve as a starting point for discussion, as well as for redirections in the public health policies seeking appropriate care to people with disabilities and providing OPMs for that population. The results can serve as a starting point for discussion of the equity for the directions of health policies and public resources seeking for the proper care of people with disabilities and the provisioning of OPMs for that population.

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