

People with disabilities: some analyzes of the results of the 2010 Population Census and new challenges

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Abstracts

In his work, was applied crossings between pairs of variables, homogeneity test and technical exhaustive AID (Automatic Interaction Detection) for formation of groups for sample studied of according each of the following deficiencies: see, listen, move and mental from data set obtained from the 2010 Population Census data sample (respondents Complete the Questionnaire) formed by 20,635,472 people interviewed all over the country with the objective of studying relationship between different variables such as disability, level of education, gender, income in minimum wages among others.

Keywords: Exhaustive automatic interaction detection, homogeneity test, homogeneous groups

1. Introduction

It's currently regarded as a fact that has always existed throughout history people with disabilities (Smith, 1986; Carvalho, 2001). Gradually, societies perceive that beyond the charity and assistance, such persons should be included in programs and policies that could enhance their productive potential (Silva, 1986; Sunday, 2006; Figueira, 2008). In fact, the very people with disabilities were showing signs that they could and wanted to study, work and be fully included in society (Garcia, Santos, 2010).

Even with these advances, whether in historical terms, as the paradigm shift that allow people with disabilities to be citizens, as in the legal field with the existence of laws and decrees that established these rights, however, the participation of these people also is very restricted. According to the IBGE Census 2010, it is estimated that a little less than 5% had completed higher education, which indicates that a high number of people with disabilities continue exerting informal activities, poor and discontinuous or simply have no occupation, living based on retirement, pension and / or family support.

It's thought that the working low conditions of the people with disabilities are due to situations such as difficult access to education, inadequate infrastructure, lack of information and bias on the part of schools and companies that make these people with a lower level of schooling impeding the entry of them in the formal labor market.

The reversal of this situation is no simple task. According to experts (Garcia, 2010), this requires actions by at least seven key aspects:

a) Expanding public knowledge about people with disabilities and their integration in education and work; b) Better discussion, mobilization and dissemination of issues related legislation; c) The strengthening of educational inclusion and possibilities of professional qualification (Domingos, 2005; Garcia, 2010); d) Accessibility as a concept summary of an inclusive society; e) The consolidation of new paradigms and ways of thinking about disability issues in society in general; f) That is considered mandatory for health professionals and care social notify the Ministry of Health and met people who have been diagnosed with problems related to their disability with CIF's, and finally, and, by the end; g) Ensure that the disabled person is hired for functions that correspond to their true potential or capacity (Garcia, 2010; Rose, 2009).

In terms of statistics, it is shown that there are few studies, in formal terms, among which stands out the data obtained from the census, which allows questions such as: How

do people with disabilities are distributed throughout the country? How to evaluate the access of people with disabilities in terms of the various services mentioned above? How is the development of people with disabilities, comparing them with those without disabilities? Different disabilities are homogeneous. It is possible to form homogeneous groups. What are the variables that most contribute to the problems of disability? Answering these and other questions in statistical terms may eventually contribute to better support these people in order to be better assisted and resources are better managed and optimized by the actions of public policies in this area. In this work, we applied the homogeneity test for checking the degree of severity of the types of visual importance and technical exhaustive AID to form groups for the study population according to each occurrence of disability or not considering its degree of severity and the number of defects found.

The exhaustive AID algorithm investigates all variables; all groups were examined and selects the one that has the highest association with the dependent variable. This was done for all the independent variables and may be used in situations where the purpose is to divide the population into different segments for a given criterion. In this case, the criterion was the effect of various deficiencies Studied.

The Census is the most complex statistical operation performed by a country. In the 2010 Census, we used two types of questionnaires: basic questionnaire that was answered by all the families and the completed questionnaire to the selected sample was applied to all households selected for the sample, which in addition to basic research contained in the questionnaire, includes other features of the social, economic and demographic information important at home and search for their residents.

Issues relating to persons with disabilities were applied in full questionnaire aimed at identifying the deficiencies visual, hearing and motor activity, according to their seriousness, by people's perception of these difficulties and for those who reported mental or intellectual disabilities.

The main objective of this work is to study the relationship between deficiencies of the population and their ways of working and studying. The variables used in this study were obtained directly from the Database of Sample of respondents who answered the questionnaire and were divided into full blocks considering the following topics: identity, family, work, instruction and disability, more details can be found about the lay out and the table of sample data provided by IBGE microdata on the page in the site:

http://www.ibge.gov.br/home/estatistica/populacao/censo2010/resultados/_gerais/_amostra/resultados/_gerais/_amostra/_tab/_uf/_microdados.shtm.

2. Motivation

To be able to include people with disabilities, it's necessary, first of all, more accurately estimate what would be the amount of people who find themselves in these conditions for each of the different disabilities, how they live and where they live, and an alternative in this case, was to consider the database obtained from census 2010 for the Sample Questionnaire, and, according to this same census estimates, it's believed that there are 45,606,048 people in Brazil with at least one permanent disability, representing approximately 23.9% of all the population.

2.1. Homogeneity test

This test consists in verifying whether a random variable behaves homogeneous in several subpopulations and fixing the sample size in each of these subsets and then selects one sample each.

To calculate the expected values, assuming that there is homogeneity between subpopulations, is used for each cell (i, j), according to expression (1) below:

$$e_{i,j} = n_i \times \frac{\text{total in the column } j}{\text{overall total}} \quad (1)$$

The total line n_i indicates the sample size of the subpopulation i , whereas the quotient, total in the column j divided by the overall total, representing the proportion of occurrences of the variable value corresponding to the column j . If there is homogeneity of the behavior

of the corresponding variable, it is expected that this ratio is the same in all subpopulations.

The next step is to calculate Q^2 . What is the difference between the observed and expected values using the expression (2) below:

$$Q^2 = \sum_{i=1}^r \sum_{j=1}^s \frac{o_{ij} - e_{ij}}{e_{ij}} \quad (2)$$

where r and s represent the number of row and column respectively.

To interpret the expression of Q^2 , we note that the term $o_{ij} - e_{ij}$ indicates the difference between the observed value and expected value in row i and column j , if there was homogeneity (Magalhães and Lima, 2011).

For a large number of observations, the expression of Q^2 is chi-square with $(r - 1)(s - 1)$ degrees of freedom. The critical region contains large value of Q^2 , i.e., $RC = Q^2 : Q^2 \geq q_c$, with q_c , being determined by the significance level of the test, in other words, $\alpha = P(Q^2 \geq q_c / H_0 \text{ is true})$

In the case of this study, homogeneity tests was made between variables that represent the different disabilities and variables such as educational level, gender and income level.

2.2. Technical exhaustive AID

It is a technique used in situations in which the objective is to divide the population into differentiated segments in relation to a given criterion. The exhaustive AID is based on chi-square test on a contingency table between the categories of the dependent variable and the categories of the independent variables (Canton, 1980; Johnson and Wichern, 2006). It is a statistical method for efficient segmentation. In this particular case, the criterion chosen was the incidence of defects in each of the study (Arts et al. 1996; Mora, 2010).

The final objective is to build a classification tree containing only the most important variables for the classification, along with their most significant categories for the response variable (Taconelli, 2005).

The stopping rule for the division of the groups obeys two criteria:

- when the next division result in a group with less individuals that determined (in case it was determined that the groups should have minimal, if this study, 2.5 million of the individuals), and;
- when there is more variable among the predictors that discriminate between the groups as determined level of significance. The choice of predictive variables is based on a test involving the chi-square statistic, and the example was set a significance level of 5%

One advantage of this algorithm is that stop the growth of the tree before the problem of over fitting; another is that the result can be interpreted graphically. One of the disadvantages of AID exhausting algorithm is that require large amount of data to be able to ensure that the amount of observations of leaf nodes is significant (Taconelli, 2005; Rodrigues, 2005).

3. Results and discussions

This paper considers data from the Census of 2010, though, present deficiencies such as lack of other variables of interest, such as whether the disability has been acquired at birth or after a certain age who were not included in the complete questionnaire research that has been treated more comprehensively the issue of persons with disabilities. These data are useful for identifying the number of people with visual, hearing, mobility and mental, as well as its corresponding severity level to better assess and provide support for better targeting of public and private resources that can help improve the quality of life of these people.

For this study we also created the following variables with their respective categorizations in its topics: i) work: income in minimum wages (mw, which at the time of the completion of Census 2010 was 510 reais) categorized as 1, gain of 0 to 1 mw; 2, 1 to 3 mw; 3, 3 to 7 mw; 4, 7 to 10 mw and lastly, 5, 10 or more mw; ii) identification: Identification (number questionnaire or individual) and categorized age (1, if 0 to 15 years, 2 if you are aged 15 to 65, and finally, 3, 65 or more; iii) family: number of children categorized (1 for free son; 2 for the number of children between 1 and 2; 3 for many children between 3 and 5, and finally, 4, number of children from six or more), and finally, iv) deficiency problems:

deficiencies (number of deficiencies that each individual possesses, and ranges from 0 to 4) and defic1 (0 is disabled and does not have one if you have at least one disability).

Tables 1 shows the distribution of proportion in % for the variables total, able to read and write, educated, gender, age and income range categorized for each level of the variable deficiencies.

Table 1. Distribution in (%) of disabilities for the variables disabilities, total, read and write, instruction level, sex, categorical age and income class.

disabilities	total	read and write		instruction level				sex		categorical age			income class				
		yes	no	1	2	3	4	male	female	1	2	3	1	2	3	4	5
0	76.1	90.4	9.6	60.2	14.9	18.7	5.7	51.3	48.7	32.6	64.2	3.3	27.5	57.8	10.3	2.2	2.2
1	17.2	82.8	17.2	64.7	13.4	16.0	5.6	45.3	54.7	10.6	75.1	14.3	34.7	52.1	9.2	1.9	2
2	5.0	68.0	32	81.0	8.6	7.9	2.4	41.9	58.1	3.4	59.6	37.1	47.6	44.1	6.1	1.1	1.1
3	1.6	57.3	42.7	87.7	5.9	4.8	1.5	41.7	58.3	2.3	41.0	56.7	55.4	38.6	4.4	0.8	0.8
4	0.1	47.8	52.2	88.9	5.1	4.4	1.5	45.0	55.0	5.8	47.9	46.3	57	37.2	4	0.9	0.9

In examining Table 1 shows the in variable total 76.1% of respondents shows no deficiencies considered in this study, shows one deficiency 17.2%, 5% two, three 1.6%, and, finally; 0.1% presents four types of deficiencies studied.

Note also that the greater the number of deficiencies that the person has, the lower the proportion of those people who can read, the greater the proportion of people attaining maximum incomplete elementary and lower the proportion that is level and complete instruction or more fundamental level, which shows that the greater the number of shortcomings, the greater the difficulty these persons to reach a higher degree of training. It also shows the great disparity between people who do not have disabilities and those with at least one of the deficiencies at all levels of instruction.

Consider the different age groups shows that people who have no more than two shortcomings are more concentrated in the age group between 15 and 65 years, the group of people that have three deficiencies are more concentrated in the age of 65 years and group of people from the four studied with disabilities are more concentrated in the age group between 15 and 65, it is also possible that the measure increases the number major deficiency is the tendency of these people to become more concentrated in the range between 0 and 1, with a minimum wage to four considered in the study and decreases in other income ranges, and also shows the great disparity between people who do not have disabilities and those with at least one of the deficiencies in all income brackets.

Tables 2 shows the distributions of ratios in % for variables read and write, level of education, gender, age and income groups categorized for each level of the variable see.

Table 2. Distribution in (%) of to see for the variables disabilities, total, read and write, instruction level, sex, categorical age and income class.

to see	total	read and write		instruction level				sex		categorical age			income class				
		yes	no	1	2	3	4	male	female	1	2	3	1	2	3	4	5
0	0.2	69.8	31.2	71.8	10.6	12.2	4.9	47.7	52.3	13.6	55.8	30.6	25.2	56.4	12.1	2.9	3.4
1	3.3	70.3	29.7	77.2	9.9	9.9	2.8	45.3	54.7	5.5	63.9	30.6	45.9	46.0	5.9	1.1	1.0
2	15.1	81.4	18.6	68.5	12.7	15.1	5.4	41.9	58.1	8.0	73.4	18.6	36.0	51.1	9.1	1.9	2.0
3	81.4	89.2	10.8	62.5	14.2	17.5	5.5	41.7	58.3	31.3	64.1	4.7	28.1	57.4	10.2	2.1	2.2

From the results of Table 2 show that 0.2% of respondents can't see any way 3.3% can see with great difficulty, 15.1% can see with some difficulty, and finally 81 4% do not exhibit any deficiency in visual terms.

It is also observed that the higher the degree of severity of the disability, the lower the proportion of people who can read and write.

With regard to the level of instruction is noted that the greater the severity of visual impairment less is the possibility of obtaining a better educated, except that the group of

people who can't see any way tend to have a better educated than the group of people who can see with difficulty, once, the group of people who can not see any way has a higher proportion of people with education level at most elementary education and a lower proportion of people with complete primary level or more.

The predominance of females in all different severities of visual impairment. Regarding the age groups shows a prevalence of between 15 and 65 years,

The Table 2 also shows that the group of people who can't see any way they focus more on income range between one and three minimum wages, the group of people who see with difficulty are more concentrated in the income range between one and three with the proportion of 46.0 followed by income range between zero and with a minimum wage proportion of 45.9%, and finally, as the group of people who see with some difficulty are more concentrated in the income range between one and three minimum wages.

In order to evaluate the different degrees of severity yeah, can not in any way but with much difficulty, homogeneity tests were performed for these severity levels of the variables see, around and hear that in all cases were obtained level significance of 0.000 for this test and concluded that there is no homogeneity between these levels tested.

The graphs of Figures 1 and 2 show the diagrams for AID number of deficiencies (deficiencies) and disability to see. For each of these diagrams were formed six groups: the first group (black), second (red), the third (blue), the fourth (green), the fifth (brown) and sixth (pink).

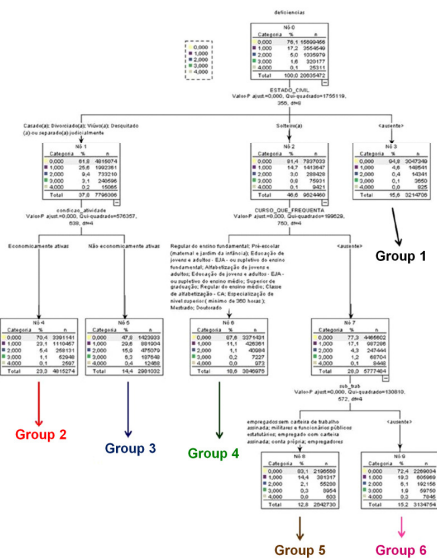


Figure 1. Diagrama AID for dependent variable disabilities.

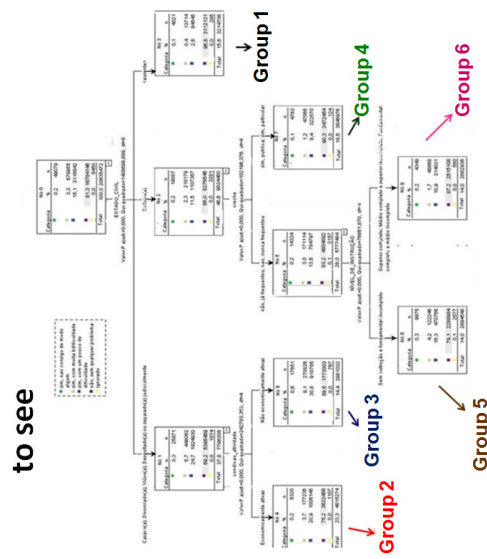


Figure 2. Diagram AID dependent variable to see

Studying graphic diagram of Figure 1 AID shows that the variables that most contribute to the appearance of a smaller number of disabilities are unmarried, economically active, attending a course and do not have secondary employment.

Among the different profiles of the groups formed what best contributes to fewer disabilities is the group formed by four unmarried and attending a course, while the profile that contributes most to the increase in the number of disabilities is the group 3 formed by being married, divorced, widowed, legally separated condition and not economically active.

For the case of Figure 2 shows that the variables that most contribute to a lower incidence of visual impairment are unmarried, activity status, economically active status, level of education from primary level onwards and attended or attends daycare.

Considering these observations, the better is the group formed by 6 which presents unmarried, have attended daycare, education level completed elementary onwards followed by group 4 unmarried and attends public or private kindergarten, while the largest contributor to the increase visual impairments is group 5 consists of being married,

divorced, widowed, separated or legally separated and not economically active.

4. Conclusions

The greater the number of disabilities tends to be the lowest level of education and income that these people will get in their work.

The level yes, I cannot in any way tends to achieve better levels of education and income level rather than the level, but very difficult for variables to see deficiencies, around and listen.

Note the existence of a large gap between people with disabilities and without disabilities as the level of education and income level, with the highest concentration of people with disabilities in the income ranges between 0 and 1 mw and between 1 and 3 mw, and; educated to uneducated incomplete primary. The higher the level of education and a higher income bracket, the greater the inequality between disabled and non-disabled.

The profile that most contributes to the incidence of these deficiencies is formed by being married, widowed, divorced, separated situation legally and economically inactive.

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