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Socio-demographic correlates of mobility disability in older Brazilians: results of the first national survey

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Abstract

Introduction: socio-economic differences in mobility disability prevalence in old age have been reported from the US and Europe. Brazil is characterised by gross socio-economic inequalities, but there have been no previous national data on disability prevalence.
Aim: this study aimed to estimate disability rates and explore associations identifying the most significant socio-economic markers associated with mobility disability prevalence in old age in Brazil.
Subjects and methods: a nationally representative sample of 28,943 people aged 60 years or over was interviewed, in the 1998 National Household Survey (PNAD), conducted by the Brazilian Institute of Geography and Statistics.
Results: the prevalence rates of markers of mild, moderate and severe disability were higher in women than men, and increased with age. Prevalence rates of difficulty with personal care and medium distance walking were broadly similar to England, but far more Brazilians reported difficulty climbing stairs. In logistic regression analyses, the strongest markers associated with increased mobility disability prevalence were age, gender, lack of education and low income. Rural residence was also associated with reduced prevalence. Limited differences by region were present, and there were mixed effects for self-reported racial group for women.
Conclusions: disability in the older population of Brazil shows familiar prevalence patterns by age and gender. Disparity in income and educational attainment in Brazil are the most important markers associated with group differences in mobility disability prevalence in old age.

Keywords: *disability, older people, Brazil, socio-economic status*

Introduction

Increasing adult life expectancy and greater numbers of people surviving into old age is a global phenomenon, affecting both developed and developing countries [1]. Key to understanding and responding to population ageing is information on disability. Disability is commonly defined as a restriction in the ability to perform normal activities of daily living [2], and quantifies the impact of disease or injury. Disability is a particularly useful concept in assessing the health of older people, because most older people have several diseases simultaneously, and diseases vary greatly in severity and impact on everyday life. Disability has powerful effects on individual well-being, the need for informal help and health care, and on long-term care needs and costs [3]. However, the great majority of existing studies of disability are from developed countries.

In Brazil, there have been few studies of disability in older people [4] and no national datasets. The 1998 National Household Survey (PNAD) interviewed a large nationally representative sample, and included items on disability. This paper aims firstly to provide national estimates of the prevalence of physical disability in older people. Brazil is noted for having extremely large socio-economic inequalities [5], regional and racial differences. The study also aimed to establish whether these factors are associated with differences in mobility disability prevalence in old age. Reporting of many difficulties, including for example going up stairs or using a shower, may be biased by differing availability by

socio-economic group, but difficulty walking 100 metres is resource neutral and was therefore chosen for socio-economic analyses.

Subjects and methods

The PNAD survey

The PNAD in 1998 was conducted by the Brazilian Institute of Geography and Statistics (IBGE). The data used in this survey are representative of the whole population residing in Brazil in September 1998 (excluding rural areas in the Northern Region, which did not participate).

The PNAD survey employed a three-stage self-weighting sample design, stratified by state and metropolitan area. The primary sampling units were the municipalities, which were stratified by size (population), and selected proportional to population size. In the second stage, the census enumeration areas (EAs) were selected proportional to population size, where size was measured by number of households. A simple systematic and representative sample of households was then drawn in the third stage. Unofficial settlements, or 'shantytowns', were included in this sample, although it is difficult to assess the representativeness of the obtained sample in these areas.

Of 112,434 households sampled, 80.9% were interviewed, and 28,943 people aged 60 years and over were included in the sample. All persons in the household were interviewed, when possible. Comparisons of the unweighted survey data with census information confirmed its representativeness for gender and age.

The survey interview covered demographics, employment and occupation, health and physical mobility, education, income, migration and household condition.

Disability questions were asked in the following format (in Portuguese): normally, due to a health problem, do you have difficulty: 1. feeding, taking a shower or going to the bathroom; 2. running, lifting weight, doing sports or doing heavy work; 3. pushing a table or doing housework; 4. climbing steps; 5. kneeling down or bending down; 6. walking more than 1 km; 7. walking approximately 100 metres? Response codes were 'unable', 'great difficulty', 'little difficulty', 'able' or 'unknown'.

As disability is a progressive process, three of the above measures were chosen as markers of different severities of physical disability. Firstly, 'difficulty feeding, taking a shower and going to the bathroom', covering basic activities of daily living, was taken as a marker of severe disability. Secondly, difficulty walking more than 100 metres was taken as a measure of moderate disability. Finally, difficulty walking more than 1 km was taken as a measure of mild disability. These three measures were selected because they have a clear everyday meaning, are relatively culture free and have been commonly used in previous work as disability markers. They were measured independently, so no attempt has been made to exclude people with other disabilities from being counted as disability free for each of these disability questions.

Measures of socio-demographic status included sex, age, self-declared racial group (black, mixed, white or other), region of residence, rural/urban residence, education, income, family composition, family and household size, home ownership, housing condition and possession of goods. Education was assessed in terms of years of schooling. Family *per capita* monthly income – expressed as quintiles – was computed from total family income in the month preceding the interview, divided by the number of people in the family. Size of residence was assessed as the total number of rooms in the residence and family size was the total number of members within the family (living in the household). Two composite measures were created for housing condition and possession of goods. The housing condition index took into account the existence of water in the household from the distribution network; sewerage connected to a collection network or a pit latrine; refuse collection straight from the household and light from an electric source. The possession measure was based on the household owning a refrigerator, telephone and washing machine.

Of the 28,943 elderly people for whom interview data were available, missing values were present for two on race, 14 on education, 1,161 on family income, 35 on house tenure, 35 on possession of goods and 33 on sanitary housing condition; these were excluded from the analysis. The data were analysed in SPSS version 10 (SPSS Inc.). Information on each subject was obtained from the subject themselves in 63.5% of cases, from an informant in the household in 32.7% and an informant living outside the household in 3.8% of cases.

The logistic regression procedure was used to get two models, with difficulty walking 100 metres as the dependent variable. Model 1 presented the age-adjusted odds ratios (OR) for having difficulty walking 100 metres in men and women separately, by each variable considered in the study (univariate associations). Model 2 shows the multivariate odds adjusting for all other included variables. Age-adjusted models are presented for each sex.

Results

There were 28,943 people aged 60 years and over in the study, of whom 44.1% were men and 55.9% were women. Most of the sample lived in the two major regions of the country, Southeast and Northeast, and were concentrated in the urban areas (Table 1). The number of women was greater than the number of men and approximately half the sample was over 70 years old. Receipt of education was limited and some of the sample were living on very low incomes. The median of family monthly income was around R$160 (£44) per person, rising to R$780 (£217) per person in the top quintile. Most respondents lived with their families, but 11.9% lived alone.

The most common disabilities were for the most demanding tasks, such as climbing steps or walking more than 1 km kilometre (Figure 1). Difficulties with basic activities (feeding, showering or bathing, asked as a group) were least common, affecting 13.4% (95% CI 11.8–15.0) of men and 17.1% (95% CI 15.7–18.5) of women. Gender differences were significant with Brazilian women reporting more disability than men, as in other countries.

Table 1. Distribution (%) of the study sample by socio-demographic characteristics and gender

	Men		Women	
Variables	*n* = 12,757 Column %	(95% CI)	*n* = 16,186 Column %	(95% CI)
Age group				
60–64	33.0	(31.5–34.4)	31.0	(29.7–32.2)
65–69	26.6	(25.1–28.1)	24.8	(23.5–26.1)
70–74	18.4	(16.8–20.0)	19.2	(17.8–20.5)
75–79	11.7	(10.1–13.3)	12.0	(10.5–13.4)
80–84	6.4	(4.7–8.0)	7.6	(6.2–9.1)
85+	4.0	(2.3–5.7)	5.5	(4.0–7.0)
Region of residence				
Northeast	28.2	(26.7–29.7)	27.7	(26.4–29.0)
North[a]	3.6	(1.9–5.3)	3.3	(1.7–4.8)
Southeast	47.0	(45.8–48.3)	48.6	(45.5–49.7)
South	15.6	(14.0–17.2)	15.7	(14.3–17.1)
Central-west	5.7	(4.0–7.3)	4.8	(3.3–6.3)
Race				
Black	6.9	(5.3–8.6)	7.1	(5.6–8.6)
Mixed	35.1	(33.7–36.5)	32.5	(31.3–33.8)
White	56.9	(55.7–58.0)	59.5	(58.5–60.5)
Other	1.1	(0.0–2.8)	0.9	(0.0–2.4)
Place of residence				
Urban	77.9	(77.1–78.7)	83.2	(82.6–83.9)
Rural[a]	22.1	(20.6–23.6)	16.8	(15.4–18.2)
Years of education				
Illiterate	37.2	(35.8–38.6)	41.9	(40.7–43.1)
1 up to 3	22.7	(21.2–24.3)	21.0	(19.7–22.4)
4 up to 7	23.5	(21.9–25.0)	23.3	(21.9–24.6)
8 or over	16.6	(15.0–18.2)	13.8	(12.0–15.2)
Family composition				
Single	8.1	(6.4–9.8)	14.8	(13.4–16.3)
Couple	36.0	(34.6–37.4)	23.9	(22.6–25.3)
With children	47.5	(46.2–48.7)	48.8	(47.7–49.9)
Other	8.4	(6.8–10.1)	12.5	(11.0–13.9)
Housing tenure				
Owned	85.6	(85.0–85.3)	85.4	(84.8–86.0)
Renting	6.7	(5.0–8.3)	6.7	(5.3–8.2)
Concession[b]	7.4	(5.7–9.0)	7.6	(6.1–9.1)
Other	0.4	(0.0–2.1)	0.3	(0.0–1.8)
Possession of household goods (telephone, washing machine, refrigerator)				
Zero or one	55.3	(54.1–56.4)	52.5	(51.4–53.5)
Two	21.8	(20.2–23.3)	23.7	(22.3–25.0)
Three	23.0	(21.4–24.5)	23.8	(22.5–25.2)
Sanitary housing condition				
Good	42.9	(41.5–44.2)	48.2	(47.1–49.3)
Poor	57.2	(56.0–58.3)	51.8	(50.7–52.9)

[a]The rural areas in the North region did not participate.

[b]Housing tenure 'concession' involves unpaid occupancy by permission of the owner, usually linked to work.

Distribution of specific disabilities

Difficulty in walking more than 1 km, difficulty in walking more than 100 metres and difficulty in feeding/taking a shower/going to the bathroom were selected in this study as the best markers of mild, moderate and severe disability respectively. The prevalence of all three markers increases with age, and is higher in women (Figure 2).

Logistic regression models (Table 2) were developed to explore the role of factors associated with difficulty walking 100 metres, firstly univariately and then multivariately.

At the first step, univariate associations were estimated to assess the role of socio-demographic factors in disability in older persons. After adjusting for age, the following factors were all associated with disability: race (for women), housing conditions, education, size of residence, rural/urban residence, family income and possession of goods, and sanitary housing conditions (for women). There were some regional effects, but these differed between the genders. Strikingly large associations were present for income and education, with odds of disability in the least deprived categories being a half or less of those in the most deprived groups.

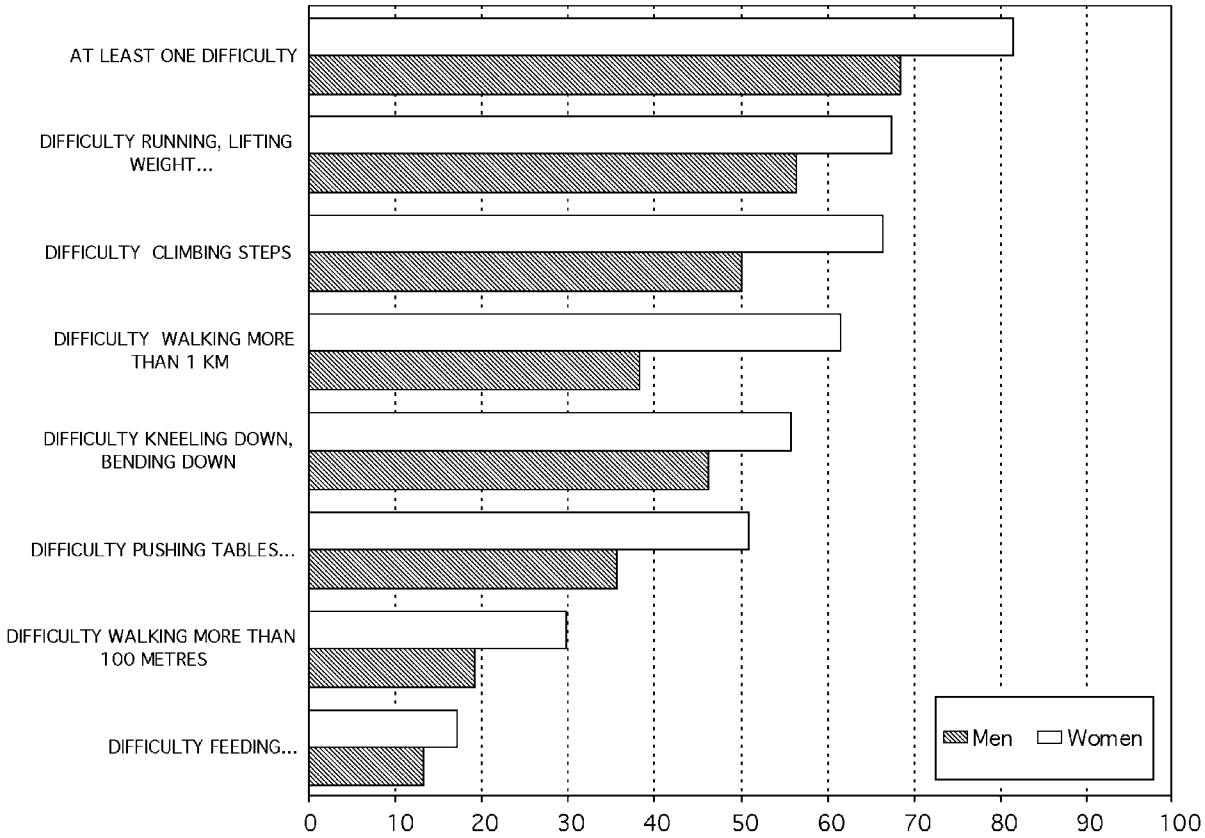

Figure 1. Prevalence of disability in older Brazilian people aged 60 and over, by type of disability and gender. Note: Difficulty 'feeding' includes feeding, going to the bathroom or taking a shower.

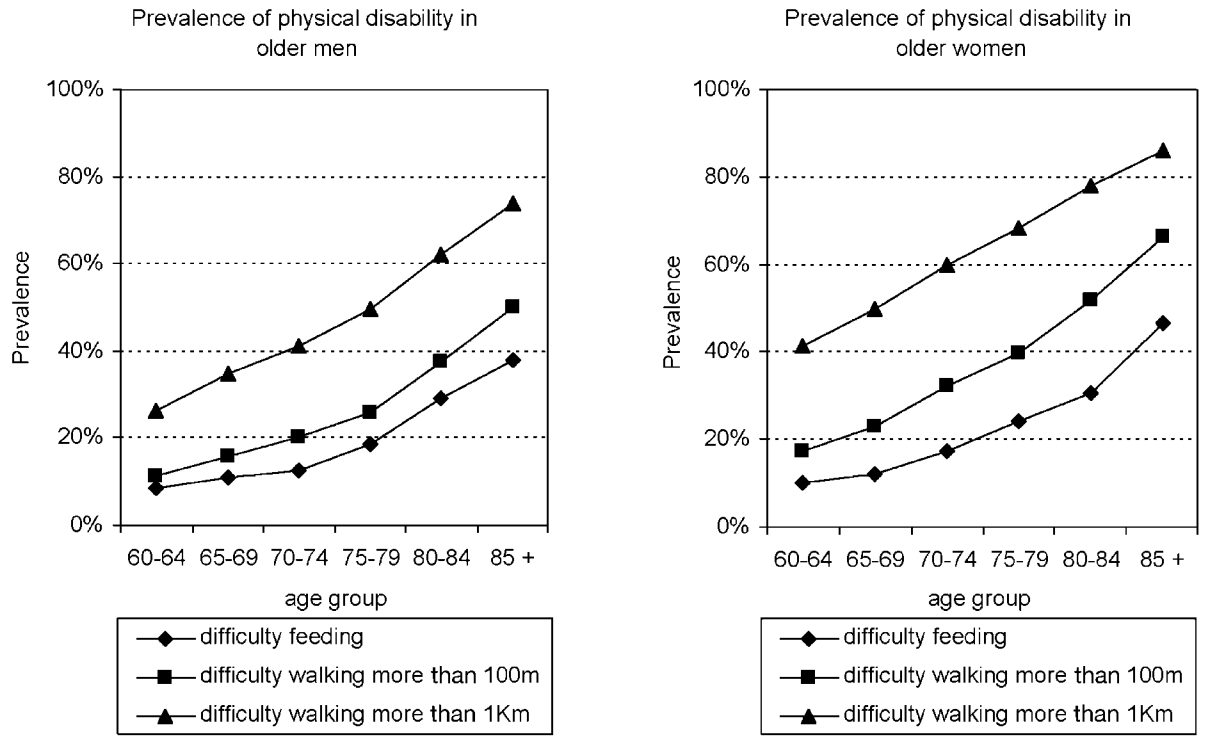

Figure 2. Prevalence of physical disability in older men and women by age group. Note: Difficulty 'feeding' includes feeding, going to the bathroom or taking a shower.

Table 2. Prevalence and adjusted odds ratios (OR) for having difficulty walking 100 m, by socio-demographic status variables, with 95% confidence intervals

	Prevalence of difficulty walking (%)		Age adjusted OR[a]		Multivariate OR[b]	
Variables	Men	Women	Men	Women	Men	Women
Region			$P < 0.0005$	$P < 0.0005$	$P < 0.0005$	$P = 0.215$
Northeast	18.7	31.8	1	1	1	1
North	23.2	32	1.43 (1.18–1.74)*	1.03 (0.88–1.21)	1.39 (1.12–1.72)*	0.99 (0.83–1.18)
Southeast	19.6	28.9	1.17 (1.05–1.31)*	0.91 (0.83–0.99)*	1.31 (1.14–1.50)*	1.05 (0.94–1.16)
South	17	25.7	0.97 (0.84–1.12)	0.78 (0.70–0.86)*	1.09 (0.93–1.29)	0.91 (0.80–1.03)
Central-west	17.6	28.5	1.04 (0.87–1.24)	0.96 (0.83–1.11)	1.17 (0.97–1.42)	0.96 (0.82–1.13)
Race			$P = 0.092$	$P < 0.0005$	$P = 0.154$	$P = 0.009$
Black/mixed	19.5	31	1	1	1	1
White	18.5	28.4	0.92 (0.84–1.01)	0.84 (0.78–0.90)*	1.09 (0.97–1.21)	1.13 (1.03–1.23)*
Place of residence			$P < 0.0005$	$P = 0.005$	$P < 0.0005$	$P < 0.0005$
Urban	19.6	29.9	1	1	1	1
Rural	16.3	27	0.75 (0.67–0.84)*	0.87 (0.79–0.96)*	0.70 (0.61–0.81)*	0.65 (0.58–0.74)*
Education (years)			$P < 0.0005$	$P < 0.0005$	$P < 0.074$	$P < 0.0005$
Illiterate	23.6	37.7	1	1	1	1
1 up to 3	18.3	27.4	0.82 (0.73–0.93)*	0.72 (0.66–0.80)*	0.86 (0.76–0.99)*	0.74 (0.67–0.83)*
4 up to 7	16.4	23.7	0.76 (0.67–0.86)*	0.58 (0.53–0.64)*	0.85 (0.73–0.98)*	0.65 (0.58–0.73)*
8 or over	12.7	16.7	0.57 (0.49–0.66)*	0.38 (0.33–0.43)*	0.85 (0.69–1.03)	0.49 (0.42–0.58)*
Family income per person Quintiles			$P < 0.0005$	$P < 0.001$	$P < 0.0005$	$P < 0.0005$
1 (lowest income)	21.8	33.9	1	1	1	1
2	26.8	35.8	1.12 (0.98–1.28)	0.96 (0.86–1.07)	1.09 (0.94–1.26)	1.01 (0.89–1.13)
3	17.2	29.8	0.74 (0.64–0.86)*	0.82 (0.72–0.92)*	0.69 (0.58–0.81)*	0.89 (0.78–1.01)
4	16.4	26.8	0.71 (0.62–0.82)*	0.72 (0.64–0.81)*	0.61 (0.51–0.73)*	0.86 (0.75–0.99)*
5 (highest income)	11.6	20.4	0.47 (0.40–0.55)*	0.45 (0.40–0.51)*	0.43 (0.35–0.53)*	0.72 (0.61–0.84)*
Family composition			$P = 0.422$	$P = 0.289$	$P = 0.711$	$P = 0.801$
Single	22.7	32	1	1	1	1
Couple	19.6	26.4	0.89 (0.75–1.05)	1.01 (0.89–1.13)	0.97 (0.73–1.28)	1.04 (0.87–1.24)
With children	17.4	28.6	0.89 (0.75–1.05)	1.05 (0.95–1.17)	1.00 (0.68–1.48)	1.00 (0.81–1.24)
Other	20.8	35.1	0.84 (0.68–1.04)	1.12 (0.98–1.27)	0.90 (0.63–1.29)	1.06 (0.86–1.29)
Family size			$P = 0.351$	$P = 0.055$	$P = 0.453$	$P = 0.198$
Number in family (continuous variable)			0.97 (0.90–1.04)	1.05 (1.00–1.10)	0.95 (0.80–1.13)	1.07 (0.97–1.18)
Size of residence			$P < 0.0005$	$P < 0.001$	$P = 0.004$	$P < 0.0005$
Number of rooms (continuous variable)			0.92 (0.90–0.94)*	0.91 (0.90–0.93)*	0.96 (0.94–0.99)*	0.96 (0.94–0.98)*
Housing tenure			P = 0.204	P = 0.879	P = 0.414	P = 0.944
Owned	18.9	29.1	1	1	1	1
Rented	19.9	29	1.12 (0.94–1.35)	1.01 (0.88–1.17)	1.08 (0.90–1.31)	0.99 (0.86–1.16)
Number of goods owned (of phone, washing machine, refrigerator)			$P < 0.0005$	$P < 0.001$	$P < 0.366$	$P = 0.050$
Zero or one	21.3	33.5	1	1	1	1
Two	18.1	27.6	0.86 (0.76–0.96)*	0.76 (0.69–0.83)*	1.00 (0.87–1.15)	0.94 (0.84–1.04)
Three	13.8	22	0.63 (0.56–0.71)*	0.54 (0.49–0.59)*	0.89 (0.75–1.07)	0.84 (0.74–0.97)*
Sanitary housing condition			$P = 0.542$	$P < 0.0005$	$P < 0.0005$	$P = 0.014$
Poor	18.9	31.2	1	1	1	1
Good	18.9	27.5	1.03 (0.94–1.13)	0.81 (0.75–0.87)*	1.26 (1.11–1.43)*	0.94 (0.85–1.04)

Income divided into 5 categories based on population frequency – each group has an approximately 20% prevalence.

[a]Adjusted for age.

[b]Adjusted for the other variables in the table plus age.

*Statistically significant at $P < 0.05$.

After adjusting for all variables in Table 2, in both men and women, lower income and lower educational levels showed the strongest associations with increased risk of disability. Living in urban rather than rural areas was also a significant risk for disability in both genders. There was a modest association between being white and disability for females, in contrast to the opposite association in the univariate model, of a modest excess of disability in black women. Also in women, owning fewer of the studied household possessions was associated with disability. A modest increase in disability in men living in good sanitary conditions emerged in the multivariate model.

Discussion

Disability in old age is a key marker of population health, as older people usually have more than one illness, and the functional impact of combined conditions provides a better measure of health than do diagnostic categories. In addition, in developing countries, access to physicians is limited, and reporting of disease is therefore likely to be unreliable.

In this study we have shown that the overall pattern of disability in Brazil has the relationships familiar from studies elsewhere, of increasing prevalence by age, and higher prevalence rates reported by women.

Brazil is a country with great diversity, including regional differences, racial diversity and differences in family and household composition. In this analysis we expected that these factors would be associated with disability differences, but in fact the results show that material circumstances and education are the dominant markers of disability differences.

In evaluating these results we must consider the limitations of the data. The rural sample is not complete, probably due to the practical difficulties faced in these areas, and with the rural north region not participating. Questions about disability covered mainly physical functioning, and there were no cognitive or mental health measures. Thus, these factors are only reflected if they were severe enough to affect the areas of physical functioning on which questions were asked.

Ideally, analysis of the distribution of disability should include data on known risk factors such as smoking, alcohol abuse and exercise. In addition, good disease data would be very helpful in understanding the pathologies and injuries driving the development of disability. Unfortunately, no health behaviour data were obtained, and the illness data available are self-reported, and likely therefore to be of limited accuracy, in a country with mixed access to formal health care.

In studying socio-economic differences in disability, it is clearly important that the questions asked mean the same thing across social groups, and that accurate data are obtained. The disability questions on, for example, feeding, going to the bathroom or taking a shower, may be biased by the availability and different nature of facilities for different groups, and thus cannot be used in the regression models. For the income variable, in general, values are thought to be lower than the real value, and there may be a tendency for low wage workers to be recorded as receiving the official minimum wage. Nevertheless, reported income is probably a good measure on which to divide the population into five broad income groups, as we have done in this analysis.

Although the available data have limitations, they also have enormous strengths. These include the very large sample size and its national coverage. In fact, this study provides the first national data on disability in older people in Brazil. The dataset includes a comprehensive range of demographic and socio-economic variables, thus allowing analysis of which of these are most important in influencing disability prevalence. Finally, the disability data include information on widely used markers of the disablement process, including mobility disability.

For both men and women, age is closely linked to a higher prevalence of disability. However, even at advanced age in this sample, many older people have mild or no disabilities, and demonstrate that disability and age are not synonymous [6]. Our data confirm the great heterogeneity of functional status in even the oldest-old population, and underline the point that disability is not an inevitable or natural consequence of chronological age, but must be evaluated on an individual basis.

Brazil is a developing society, with great socio-economic inequalities. According to the Human Development Report [7], Brazil has the second most unequal distribution of income in the world, following India. Educational levels especially in older people are low, and many live in poor housing without modern sanitation. In addition, most live with their children, in extended households, and many remain economically active in old age [7]. Access to health care is very limited for the poor. We expected therefore to find prevalence rates of disability that differed greatly from those reported from populations in wealthy industrialised countries.

Overall levels of disability are difficult to compare with other countries, as reporting differences may exist, due to differing attitudes and circumstances. The Health Survey for England for 2000 [8] produced whole population prevalence rates for certain disabilities, some of which are comparable to the Brazilian data, although none is identical. Prevalence rates for slightly differing measures of personal care were similar for men, but perhaps a little higher in Brazilian women. In addition, prevalence rates for difficulty walking 200 metres (England) or 100 metres (Brazil) are fairly similar, both for men and women, although the differences in distance limit the usefulness of this comparison. However, the reported prevalence of difficulty climbing stairs was far higher in Brazil than in England. The explanation for this is unclear, although several factors point to this being an unreliable marker for international comparisons. In the PNAD question, no specific number of stairs was asked about. Also climbing flights of stairs may be an unfamiliar task for many older Brazilians, and interviewers were not given instructions on how to code responses from those who did not encounter flights of steps in their daily lives. Clearly, valid international comparisons would be very beneficial to understanding disability in older people, but special efforts are needed to ask highly comparable questions [9] and use objective measures of impairment, where possible [10].

In studying the correlates of disability, we hypothesised that regional and family structure differences would make an important contribution. We had thought that family structure and family ties could be important to the health of the elderly, as the quality of social networks has been shown to be important for both mental and physical health [11]. In fact, the main associations with disability were with markers of material well-being and education. The absence of large associations between disability and family composition or family size suggest that these factors do not influence the disablement process itself, although they may of course make supporting and caring for older people easier and more effective.

There is some suggestion in the logistic models that education is a stronger risk marker in women and income a

stronger risk marker in men. Markers of material circumstances that are widely used in the UK, for example housing tenure, are shown to be of little importance in the Brazilian context, perhaps because many poor people build their own houses on marginal or invaded land, but nevertheless consider themselves to own these homes. Instead, ownership of household goods seems to act as a second order marker, associated with some additional explanatory power, with lower disability rates in those with all three household items studied. The data studied are mostly cross-sectional, and on their own cannot identify the direction of causation for these associations. It is conceivable, for example, that older people with disabilities have lower incomes because they cannot continue working. While this could potentially explain some of the income association with disability, it clearly could not account for the association with years of education, which is completed early in life.

Racial differences in disability prevalence in old age between black and white populations in the USA have attracted much interest. In the Brazilian context, the group considering themselves to be 'white' have a small decrease in prevalence univariately in women only, but this effect reverses in the fully adjusted models. The very large sample size makes statistical detection of such small and shifting effects possible, but their real significance is unclear. In the USA, ethnic group is strongly associated with prevalence of disability, although Mendes de Leon *et al.* [12, 13] showed that black–white differences in the USA were explained by lower socio-economic status in black respondents compared to their white counterparts.

The finding for the effect of good household sanitation (i.e. for clean water, adequate removal of sewage and refuse collection) is somewhat puzzling, showing a small significant excess of disability in men, but not women. However, this only occurs in the fully adjusted model, and may be an artefact.

As disability is not an inevitable feature of ageing, and many factors modify the risks of developing disability, further work will be needed to clarify the disease, injury and health behaviour basis for disability differences in Brazil. In addition, use of objective measures of functioning or disability would greatly facilitate comparisons across such a diverse population, and internationally.

Conclusions

Disability in the older population of Brazil shows familiar patterns of higher prevalence in women and increasing prevalence with age. Family, regional and race variables were hypothesised to be important associates of disability prevalence, but they did not play an important role. Disparity in income and educational attainment in Brazil are the most important markers explaining group differences in disability prevalence in old age.

Key points

- This paper presents the first national disability prevalence data for older Brazilians.
- Prevalence rates of difficulty walking and with personal care were similar to England, especially for men.
- Less educated people and those on lower incomes had markedly higher mobility disability rates.

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