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## ORIGINAL ARTICLE

# Trends in elderly psychiatric admissions to the Brazilian public health care system

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**Objective:** To evaluate trends in psychiatric bed occupancy by elderly inpatients in the Brazilian public health care system between 2000 and 2010 and to determine the leading psychiatric diagnosis for hospital admissions.
**Methods:** Data from all 895,476 elderly psychiatric admissions recorded in the Brazilian Public Health Care Database (DATASUS) between January 2000 and February 2010 were analyzed. Polynomial regression models with estimated curve models were used to determine the trends. The number of inpatient days was calculated for the overall psychiatric admissions and according to specific diagnoses.
**Results:** A moderate decreasing trend ($p < 0.001$) in the number of inpatient days was observed in all geriatric psychiatric admissions ($R^2 = 0.768$) and in admissions for organic mental disorders ($R^2 = 0.823$), disorders due to psychoactive substance use ($R^2 = 0.767$), schizophrenia ($R^2 = 0.680$), and other diagnoses ($R^2 = 0.770$), but not for mood disorders ($R^2 = 0.472$). Most admissions (60 to 65%) were due to schizophrenia.
**Conclusion:** There was a decreasing trend in inpatient days for elderly psychiatric patients between 2000 and 2010. The highest bed occupancy was due to schizophrenia, schizotypal, and delusional disorders.

**Keywords:** Aged; trends; inpatients; hospital; psychiatric; bed occupancy

## Introduction

In Brazil, the aging index (number of people aged $\geqslant$ 60 years/100 people aged $<$ 15 years) has grown 268% between 1970 and 2010, reaching 44.8 in 2010.[1] The time required by the population aged $\geqslant$ 65 years and older to rise from 7% to 14% of the general population was 69 years in the United States (between 1994 and 2013) and 115 years in France (between 1855 and 1980), and will be just 21 years in Brazil (between 2011 and 2032).[2]

The process of population aging is accompanied by increased health and social care expenses.[3] The financial impact of an aging population on hospital care can be huge, as the elderly have higher mean hospital charges and longer hospital stays.[4] In 2003, the elderly were responsible for one third of hospitalizations in the United States. Circulatory and respiratory disorders were the most common reasons for elderly hospitalization.[4] Although not a leading reason for elderly hospital admissions, psychiatric hospitalizations were an important source of mental health expenditure, with major economic impact in many countries.[5] So, as Brazil faces an epidemiologic transition, its health system needs to be prepared for the upcoming population needs.

In this changing scenario, the epidemiological profile of mental disorders in older individuals has also been transformed,[6] with increasing rates of psychiatric disorders associated with the growth of the elderly population.[7] For instance, in 2013, 44.4 million people had dementia worldwide. In 2030 this number will reach 75.6 million; and by 2050, 135.5 million people will be affected by dementia.[8] Additionally, aging has been associated with chronic psychiatric disorders and with decreased quality of life due to psychiatric morbidity.[9] Moreover, the burden of mental and substance use disorders has increased by 37.6% between 1990 and 2010, driven by population growth and aging for the majority of these disorders.[10]

Despite the aging process, a decreasing pattern was noted for elderly acute psychiatric admission in the United States from 1996 through 2007. It is unclear if this pattern reflects good outpatient care or a constriction of geriatric mental health services.[11] The investigation of trends in geriatric psychiatric hospitalizations in an aging country such as Brazil can help the public health care system prepare for upcoming challenges. The objectives of this study were to evaluate the trends in psychiatric bed occupancy by elderly inpatients in the Brazilian public health care system between 2000 and 2010, and to determine the leading diagnosis in inpatient care.

## Methods

The Brazilian Public Health Care System Database (DATASUS) contains data from all admissions reimbursed by the Brazilian public unified health care system (SUS). Although freely accessible, this national database

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has some limitations, as it is not primarily oriented to research. The maximum length of stay allowed for reimbursement by the Brazilian public healthcare system is 30 days, and a new record is generated in DATASUS every time that length of stay is exceeded. Because the data are anonymous, it is difficult to identify multiple records referring to the same admission. Therefore, the exact number of admissions over a period and the average length of stay cannot be estimated using these data. To overcome this issue, we calculated the number of inpatient days, that is, total number of hospital inpatient days filtered by the month of admission. This operation was done for all the months analyzed in this paper, and the procedure was applied to the overall admissions and to admissions by each psychiatric diagnostic category.

Data from all 895,476 elderly psychiatric patients (age $\geqslant$ 60 years) admitted from January 2000 to February 2010 were collected from the DATASUS. This number represents the total database records, and not the actual number of admissions. Data were collected from both psychiatric and general hospitals. First, the data were downloaded from the government website.[12] Afterwards it was converted into analyzable data using the statistical software TabWin. Finally, the resulting database was exported to SPSS for statistical analysis. A detailed description of this methodology has been published elsewhere.[13]

Monthly data series were assembled with the inpatient days calculated for each month, according to overall diagnoses and ICD-10 major psychiatric diagnostic categories – organic mental disorders (F00-F09); mental and behavioral disorders due to psychoactive substance use (F10-F19); schizophrenia, schizotypal, and delusional disorders (F20-F29); mood [affective] disorders (F30-F39); and a residual group with all other categories. In this new database, the temporal variable was centralized to avoid data co-linearity. Polynomial regression models with estimated curve models were used to choose the best fitting model to the time series. The number of inpatient days by diagnosis each month was in y axis, while the centralized time was in the x axis. The dispersion diagram, residuals, and the determination coefficient ($R^2$ closest to 1) were used to choose the best-fitting model.

The % bed occupancy for each diagnosis during the period of interest was expressed as the proportion of inpatient days for each psychiatric diagnosis. The SPSS version 17.0 and Microsoft Excel 2010 were used for the statistical analysis.

The DATASUS is freely available to any citizen and does not contain any data that could be used to identify the subjects. Anonymous use of the data was approved by the Universidade Federal de Ciências Médicas da Saúde de Porto Alegre (UFCSPA) (Porto Alegre, Brazil) Research Ethics Committee (512/09).

## Results

A clear decreasing trend was detected in the number of inpatient days for the overall elderly psychiatric admissions. This decreasing trend was also observed in admissions by each major psychiatric diagnostic category, except for mood disorders. Figure 1 shows graphic representations of this trend with adjusted $R^2$ and p.

Table 1 shows the proportion of elderly inpatient days by psychiatric diagnosis from 2000 to 2010. Schizophrenia, schizotypal and delusional disorder (F20-F29) were the leading diagnoses for bed occupancy by elderly patients, with rates ranging from 60 to 65%, followed by organic mental disorders (F00-F09) (Table 1).

## Discussion

The main findings of the present study were: 1) the number of inpatient days for Brazilian elderly patients admitted with a psychiatric diagnosis showed a clear decreasing pattern between 2000 and 2010; and 2) schizophrenia, schizotypal, and delusional disorders were responsible for about 60% of the days spent in hospital during the entire period of analysis. Despite the increasing number of elderly subjects in Brazil, there was a noticeable decrease in the number of inpatient days for all psychiatric diagnoses. The only exception was mood disorders, for which the decreasing trend was not so clear without a good curve fit (adjusted $R^2 = 0.472$; $p < 0.001$). A decline in acute care psychiatric hospitalization rates has also been observed for elderly individuals in the United States, whereas acute care psychiatric hospitalization for children, adolescents, and adults has increased.[11] Since in Brazil short-stay psychiatric hospitalizations are recommended, but not mandatory, and because the public health care system does not allow admissions of more than 30 days, we were unable to discriminate the trends for length of stay.

A possible explanation for our results could be the psychiatric reform that has been underway since 2001 in Brazil, which aimed to reduce psychiatric beds and to increase outpatient care. In 10 years, the number of psychiatric beds decreased 41%, while community services have increased nine-fold and the expenses with community services and medication have increased 15% each.[14] Therefore, the decreasing trend in inpatient days could be easily explained by an expansion in outpatient care. A similar process is occurring in other countries as well. In Denmark, for example, trends in admission rates revealed a decrease in the number of available hospital beds, with a decrease of 20% in inpatient admission rates.[15] Likewise, a study in Athens, Greece, also reported a significant reduction in the number and days of hospitalization, along with improve and increased outreach, domiciliary, and day care mental health services.[16] Another possible reason for the present findings is that elders with psychiatric disorders could be living in nursing homes or have good home care, thus spending fewer days in hospital. An optimistic interpretation of our findings may be that the reduction in elderly psychiatric admissions results from better outpatient geriatric mental health care. However, it may also be a sign of a general overall restriction of psychogeriatric mental health services. This is an important issue to be clarified in further studies.

Among all psychiatric diagnostic categories, we observed that only admissions due to mood disorders did not present a

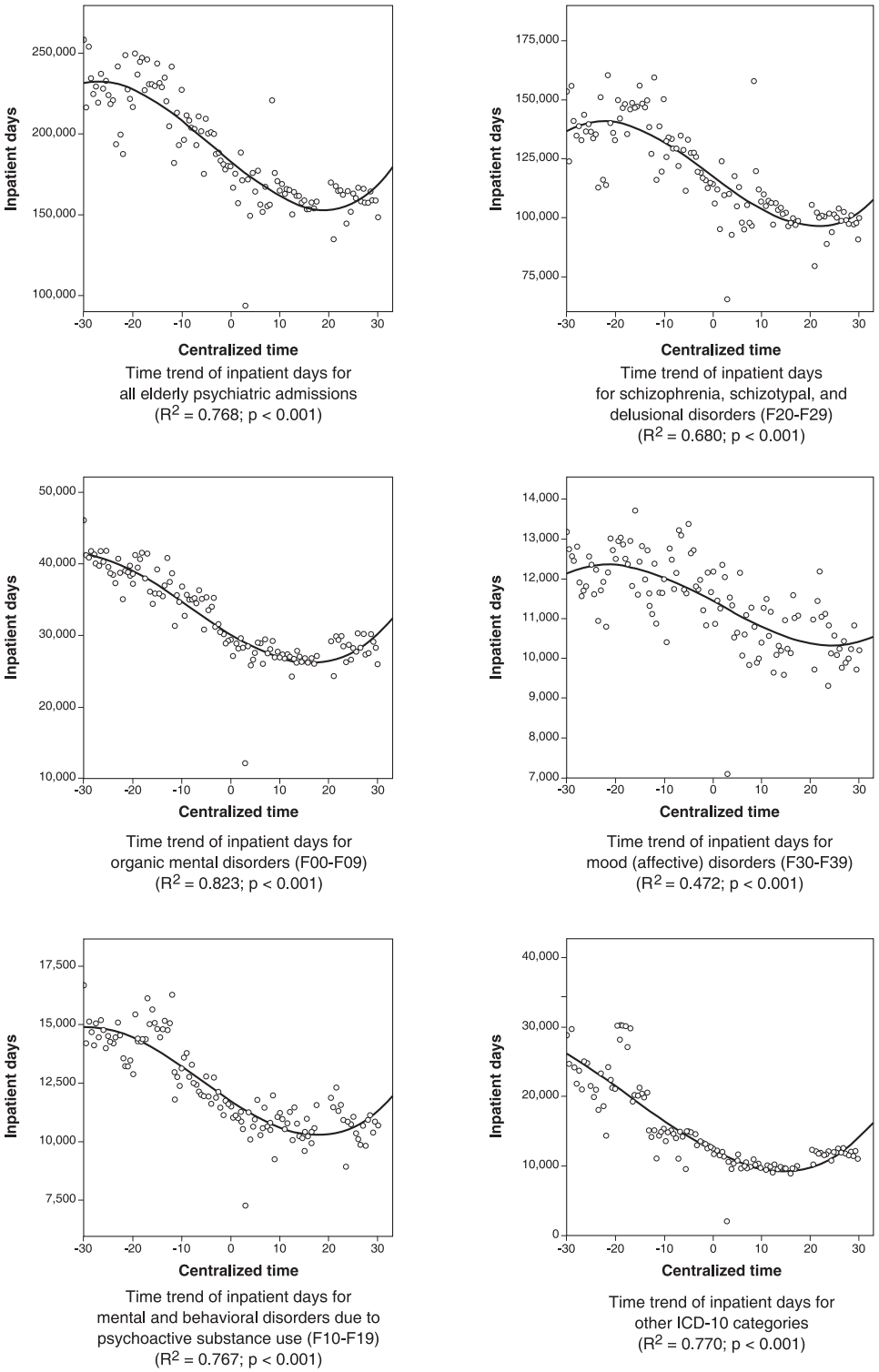


**Figure 1** Time trends of inpatient days (y) vs. centralized time data (x) (2000 to 2010) according to psychiatric diagnosis in elderly patients (age $\geqslant$ 60). All the figures represent cubic functions. All $R^2$ are adjusted.

clear decreasing trend. Admissions for bipolar disorder diagnoses have increased for all age groups, even for elderly individuals, as mentioned in a study in the United States.[11] In that paper, Blader mentions several other studies that suggest that the increase in clinical diagnoses of bipolar disorder might be the result of reframing of primary conduct disturbances and substance abuse among youth, adolescents, and adults to emphasize affective disturbances.[11]

**Table 1** Yearly proportion of inpatient days by diagnostic category

| Year | F00-F09 | F10-F19 | F20-F29 | F30-F39 | Others |
|---|---|---|---|---|---|
| 2000 | 0.178 | 0.064 | 0.601 | 0.053 | 0.105 |
| 2001 | 0.173 | 0.063 | 0.608 | 0.055 | 0.102 |
| 2002 | 0.163 | 0.065 | 0.626 | 0.053 | 0.093 |
| 2003 | 0.170 | 0.064 | 0.641 | 0.058 | 0.068 |
| 2004 | 0.169 | 0.063 | 0.635 | 0.063 | 0.071 |
| 2005 | 0.163 | 0.065 | 0.640 | 0.068 | 0.064 |
| 2006 | 0.165 | 0.064 | 0.649 | 0.063 | 0.059 |
| 2007 | 0.168 | 0.067 | 0.637 | 0.067 | 0.061 |
| 2008 | 0.194 | 0.072 | 0.595 | 0.067 | 0.072 |
| 2009 | 0.178 | 0.066 | 0.619 | 0.064 | 0.074 |
| 2010 | 0.177 | 0.070 | 0.613 | 0.065 | 0.076 |

F00-F09 = organic mental disorders; F10-F19 = mental and behavioral disorders due to psychoactive substance use; F20-F29 = schizophrenia, schizotypal, and delusional disorders; F30-F39 = mood (affective) disorders; others = all other ICD-10 categories.

Another finding that needs to be addressed is the fact that 60% of elderly subjects admitted to a hospital did so due to a psychotic disorder, as shown in Table 1. Perhaps the outpatient management of this chronic disorder has been poorly implemented, leading to high hospital use, and a specific program to treat elderly with schizophrenia in an outpatient setting might reduce bed occupancy. Moreover, in a representative sample of all age strata in the United States, patients with schizophrenia presented the highest length of stay among the diagnostic groups, although admission by this diagnosis showed a modest linear increase.[11] Other investigation have shown that the main contributor to prolonged length of stay was schizophrenia and related psychosis – accounting for approximately half (52.5%) of the patients who remained in hospital for longer than 90 days, and two-thirds (67.9%) of those remaining for longer than 365 days. The mean of total occupied bed-days was higher for schizophrenia and related psychosis, almost twice than the total observed for depression and anxiety.[17]

Some limitations of the present study should be pointed out. We only evaluated data from the public health care system, and hospitalization trends may differ in private care. Another limitation is the accuracy of the clinical diagnoses, since our data derived from a database used mainly for administrative purposes. The fact that we cannot know the exact number of admissions due to database limitations is also a weakness. There is also the possibility that clinical diagnoses are inaccurately recorded in the context of this large, nationwide database.

Despite these limitations, the findings of an overall decreasing trend in elderly psychiatric admissions, and of schizophrenia, schizotypal, and delusional disorders as the leading diagnosis responsible for inpatient admissions should be taken into account in the design of mental health strategies and policies for this growing elderly population.

## Disclosure

The authors report no conflicts of interest.

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