# The equity of admissions to the University Hospital of Brasilia

Megan Ireland[1], Maircon Batista Ribeiro[2], Mohammed Ali[1]

1. International Health Programme, School of Nursing, Midwifery and Paramedicine, Curtin University, Perth, WA, Australia
2. Faculdade de Ciências Exatas, Universidade de Brasília, Brasília, Distrito Federal, Brasil

## RESEARCH

**Corresponding Author:**
Megan Ireland
International Health Programme
School of Nursing, Midwifery and Paramedicine
Curtin University, Perth, WA, Australia
Email: meg.ireland@runbox.com

## ABSTRACT

**Background**

Brazil has a highly stratified population with large socioeconomic disparities, as evidenced by marked differentiation in health status and access to health services by the population. In addition, the fact that the universal national healthcare system and a liberalised private care model exist side by side leads to increasingly inequitable health outcomes.

**Aims**

This study aims to appraise the equity of access to the University Hospital in Brasilia, Brazil, in 2013.

**Methods**

This study was a quantitative analysis of hospital admissions data. The sample included all patients admitted over a six-month period in 2013. Patient data was crossed with socioeconomic data (income and private health insurance status). Frequency tabulations and chi-square calculations were used to describe the patient mix, observe trends and appraise equity of admissions.

**Results**

Analysis of the data showed that the number of patients from each neighbourhood relative to the neighbourhood population was equitable. However, when assessed on the basis of insurance status (i.e., deducting the population covered by private health insurance), a high level of inequity was detected (chi-square 71.828, df 3, $p<0,0001$) whereby patients from wealthier neighbourhoods were overrepresented compared to those from poorer neighbourhoods.

**Conclusion**

This study has shown that access to the University Hospital in Brasilia is not equitable when individual access to private healthcare is accounted for. The results show that dual access to both public and private healthcare is likely to be common, increasing some of the population's access to healthcare while decreasing access for others, and therefore contributing to inequity of access to healthcare services.

**Key Words**

Equity, patient admission, Sistema Único de Saúde, Brazil

## What this study adds:

**1. What is known about this subject?**
Brazil's public health system is universal in coverage and scope, but in practice services are limited, thus restricting access. Evidence suggests that health services are not equally used throughout the population, nor based on needs.

**2. What new information is offered in this study?**
While context specific, this study adds to the literature confirming that use of public health services in Brazil are inequitable, further disadvantaging those most in need.

**3. What are the implications for research, policy, or practice?**
Brazil must implement policies that ensure that those most in need of health services have access to them. In particular, legislation that regulates the private health insurance

market should be enforced in order to limit dual access to both the private and public health sectors.

## Background

Evidence of health inequality is demonstrated by significant disparities in basic health indicators and outcomes across socioeconomic categories in Brazil. Life expectancy ranges from 67.6 to 75.8 years depending on which municipality or state one lives in. Infant mortality also varies massively from 12.7 deaths per 1,000 live births in richer states to 46.4 deaths per 1,000 live births in poorer states. Disparities are also present within the distribution of health professionals and health infrastructure. Brazil has an average of 1.84 doctors per 1,000 inhabitants, ranging from 0.64 to 3.8 in the Federal District.[1] Even within states there is a particular problem of health professionals concentrating in urban and metropolitan areas, often leaving rural areas under-served. Uneven distribution of health professionals has clear consequences in utilisation rates.[2] In addition, a number of studies have shown that use of health services, particularly secondary-level service, increases with increased socioeconomic status.[3–7]

While the Brazilian population benefits from the constitutional right to free universal healthcare provided for by the state through the Unified Health System (Sistema Único de Saúde or SUS), de facto the Brazilian health sector is divided in two: the SUS accounts for 47 per cent of total health expenditure and is the sole health provider for 75 per cent of the population, while the private health system accounts for the other 53 per cent of total health financing (41 per cent in private health insurance schemes and 59 per cent in direct out-of-pocket spending) and yet only 25 per cent of the population have private health coverage.[8]

Despite private health plan holders benefitting from a network of private doctors, hospitals, and diagnostic services, an analysis of micro-data from a national family survey in 2003[9,10] indicates that for those who hold health insurance 15.7 per cent of in-patient care was actually paid for by the SUS, and that these patients account for 6.7 per cent of all in-patient care paid for by the SUS.[11] In 2003, SUS paid for 70 per cent of all in-patient care, a 4.1 per cent increase from the previous survey in 1998, while in the same period there was a 2.7 per cent decrease in insurance-covered hospitalisation and a 27.9 per cent decrease in hospitalisation paid for out-of-pocket relative to total hospitalisations, indicating that the SUS is undertaking an increasing burden of hospitalisation costs despite a growing

proportion of the population being covered by health insurance.[11]

The Federal District is the smallest of Brazil's 27 states in size, as it is essentially a city-state containing Brazil's capital, Brasilia and its suburbs. The Federal District's residents are also by far the wealthiest in Brazil with BRL 63,020 (Brazilian Reais) (USD $33,760)—US dollar conversions throughout this article are made at the historical rate for the end of 2011—per capita gross domestic product in 2011, which is twice that of the next richest state, São Paulo, and eight times more than the poorest state, Piauí.[12] Not surprisingly, the Federal District also has the highest literacy rate in Brazil of 96 per cent (2011),[13] one of the lowest infant mortality at 12.77 0/00 (2010), and the second highest life expectancy at 76.2 years (2010).[14] However, there are wide variations in all socioeconomic determinants such as income levels and health insurance status between richer and poorer neighbourhoods (administrative regions).

While the average monthly household income in the Federal District is BRL 4,641 (USD $2,486) it ranges from a quarter of the mean income in the poorer neighbourhoods to four times the mean in the richer ones. In other words, the average monthly household income can be up to 15 times more in some neighbourhoods. Overall, 33 per cent of the Federal District's population has private health insurance, but this ranges from three per cent coverage in poorer neighbourhoods to 87 per cent coverage in richer neighbourhoods.[15]

The fact that everyone has a right to public healthcare, including those who contribute to and benefit from private health coverage makes any system to prioritise access to public care unconstitutional. The question therefore of who gets access to healthcare within the SUS is paramount to the equity of the system. The concept of health equity refers to equal access to available care across socioeconomic strata, gender, age, race, geographical location, and other social determinants. The flip side, inequity in healthcare, is health disparity that is unnecessary, avoidable, and unfair.[16] Included within this notion is that if individuals or groups of individuals are better informed and more adept at accessing and making full use of healthcare than others, then this differential use is inequitable. Equity must therefore not only be measured by equal opportunity to access care, but also by equal use of health services.[17] This study therefore aims to define use by examining distribution of patient characteristics with respect to socioeconomic status (income levels and private

health insurance) in order to appraise the equity of access to the hospital.

## Method

This research used a quantitative study design based on secondary data. The study aimed to define the distribution of patient characteristics (gender, age, length of stay, admission mode, procedure specialty, costs, level of complexity, and diagnosis group) with respect to geographic residence and thus socioeconomic level, determined by income level and private health insurance status.

The patient population of the University Hospital of Brasilia was chosen for reasons of convenience due its culture being open to research. Prior to the study, ethical authorisation was obtained from the Human Research Ethics Committee in Australia as well as the national Research Ethics Committee of Brazil (Comitê de Ética em Pesquisa). The University Hospital has 198 beds, making it medium-sized and only the eighth largest (in term of beds) public hospital in the Federal District.[18]

### Sample

The sample consisted of all patients admitted for treatment at the University Hospital over a six-month period, April to September 2013.

### Data

Patient data: The data analysed in this study was a summary of patient data compiled by the University Hospital's financial administration for submission to the Hospital Admissions Authority (Autorização de Internação Hospitalar) of the SUS with the primary aim of charging for costs incurred by patients. Once submitted to the SUS and processed, this data was publically accessible online.

Socioeconomic data: The socioeconomic data (income and private health insurance status) of neighbourhoods within the Federal District were taken from the 2011 Federal District Household Survey.[15]

### Statistical analysis

All data was analysed with SPSS statistics 21 software. Frequency tabulations and chi-square calculations were used to describe the patient mix, observe trends, and appraise the equity of admissions to the University Hospital of Brasilia. A $p$ value of less than 0.05 was considered statistically significant.

## Results

### Geographic residence

The University Hospital provided services for 4,475 admissions during the six-month sample period from April to September 2013. Eighty-one per cent (n=3,624) of the patients were resident in the Federal District, while the other 19 per cent came from 10 other states in Brazil. All patients were resident in Brazil, although 0.3 per cent (n=14) were not of Brazilian nationality.

Of the 19 per cent of patients from outside the Federal District, 94.36 per cent (n=803) came from Goiás, the state inside which the Federal District is located. Of the patients from Goiás, 92.16 per cent (n=740) were resident in eight of the municipalities bordering the Federal District and can be considered as resident in the greater metropolitan area of Brasilia. Only 2.5 per cent of patients came from beyond Brasilia's metropolitan area.

### Geographic and income variables

The 2011 Federal District Household Survey divides the Federal District's neighbourhoods into four income categories based on monthly per capita income:

- high, above BRL 2,501 (six neighbourhoods);
- medium-high, between BRL 1,001–2,500 (10 neighbourhoods);
- medium-low, between BRL 501–1,000 (nine neighbourhoods); and
- low, under BRL 500 (five neighbourhoods).

Table 1 shows the number and proportion of patients, population, and population without health insurance per income group.

There was no statistically significant difference (chi-square 4.434, degrees of freedom (df) 3, $p$=0.218) between the proportions of patients and population within each income group (Table 1). However, the proportion of patients in each income group was significantly different from the proportion of the population without health insurance (chi-square 71.828, df 3, $p$<0.0001). In other words, the high-income group represented 14 per cent of the overall population and only four per cent of the population that did not have private health insurance, and yet it accounted for 21 per cent of the hospital patients. They are therefore considerably over-represented in the patient population. On the other hand, all other income groups are either normally represented or under-represented compared to their distribution in the general population or the population without health insurance.

**Table 1: Number and proportion of patients, population, and population without health insurance, per income group in the Federal District in 2011**

| Income group | Number of patients % (number) | Population % (number) | Population without health insurance % (number) |
|---|---|---|---|
| High | 20.5% (n=742) | 14.4% (n=368,198) | 4.0% (n=67,896) |
| Medium-high | 25.2% (n=914) | 32.6% (n=833, 848) | 28.3% (n=485,400) |
| Medium-low | 42.5% (n=1,541) | 42.6% (n=1,089,392) | 53.6% (n=917,734) |
| Low | 11.8% (n=427) | 10.4% (n=264,711) | 14.2% (n=242,581) |
| Total | 100% (n=3,624) | 100 % (n=2,556,149) | 67% (n=1,713,611) |

*Source: 2011 Federal District Household Survey and study data.*

**Socio-demographic characteristics of patients**

Almost two-thirds (65.3 per cent) of patients were female, while 34.7 per cent male. The female preponderance of patients was higher than the population distribution of females, where 52.53 per cent were women.

The proportion of female patients varied significantly according to income group. More than twice as many women were treated as compared to men within the lowest income group (153 per cent more) than the highest income group (70 per cent more) or the medium-high income group (60 per cent more) (chi square 8.41, df 1, *p*=0.0037).

Just under one-tenth (9.2 per cent) of the patients were under five years of age, and 19.4 per cent over 60 years. These proportions are higher than in the general population, where 6.26 per cent are under five and 12.77 per cent over 60 years of age. There were no statistically significant differences in the distribution of these age groups according to income.

**Admission (mode, level of care, specialty)**

Forty-six per cent (n=1,658) were admitted as elective cases, while 54 per cent (n=1,966) were admitted as emergency cases. Twenty-four per cent (n=395) of elective admissions were categorised as high complexity care

compared to seven per cent (n=140) of emergency admissions that were high complexity care (Table 2). Eighty-five per cent (n=3,089) of patients received medium-complexity care, while 15 per cent (n=535) received high-complexity care.

There was no statistically significant difference in the mode of admission between the two highest and two lowest income groups. However, admission mode between the high income and low-income group was significantly different (chi square 6.47, df 1, *p*=0.011) showing that the high-income group is more likely to be admitted electively. Even when the local hospital neighbourhood (which is high-income) was excluded from the calculation, *p*=0.0398 and thus still significant. There was no statistically significant difference in the level of complexity of care between the high and low-income groups.

**Table 2: Number and proportion of patients per admission mode and level of care**

| | Admissions | | | |
|---|---|---|---|---|
| | Elective | | Emergency | |
| Number | 1658 | | 1966 | |
| % of total | 46% | | 54% | |
| | Level of Complexity | | | |
| | Medium | High | Medium | High |
| Number | 1263 | 395 | 1826 | 140 |
| % admission mode | 76 % | 24 % | 93 % | 7 % |
| % of total | 35% | 11% | 50% | 4% |

Thirty-six per cent (n=1,285) of the sample was admitted for surgery, 37 per cent (n=1,336) was given clinical care, 17 per cent (n=626) obstetric care and 10 per cent (n=377) were given paediatric care. Table 3 shows the high-income group is a disproportionately heavy user of all the specialties, when its population proportion is considered, while the medium-high group is a disproportionately low user of these specialties. The medium-low patient group is about the same proportion as their population distribution, however the low-income group is a disproportionally heavy user of the obstetric and paediatric specialties.

The use of surgery and clinical care was significantly different to obstetric and paediatric care between the high and medium-high income groups and the medium-low and low-income groups (chi-square 8.16, df 1, *p*=0.0043). In other words, the high income groups were more likely to be

admitted for surgery or clinical care while the lower income groups were more likely to be admitted for obstetric or paediatric care.

## Length of stay

Twenty six per cent of patients (n=933) were admitted for one day, 25 per cent (n=922) for two days, 14 per cent (n=497) for three days, and the remaining 35 per cent (n=1,272) were admitted for over three days.

The mean length of stay was five days with a standard deviation of 7.7. There were no significant differences between income groups when comparing stays of under and over five days.

## Patient costs

The patient cost, is the cost at which the hospital is reimbursed for that patient. This is a global amount that includes all patient costs while hospitalised (consultations, procedures, food, drugs, etc). The amount is a standard amount (applied nation-wide) per principal procedure carried out rather than the actual cost of the individual patient. The mean cost per patient was BRL 837 (USD $448) ranging from BRL 21 to BRL 45,577 (USD $11–24,415) (with a standard deviation of 3047 BRL (USD $1,632). For 52.9 per cent (n=1,915) of patients the cost ranged from BRL 250 to BRL 750 (USD $134–402), in 25.2 per cent (n=912) it was under 250 BRL (USD $134) while in 22 per cent (n=797) the cost was more than BRL 750 (USD $402) as shown in Table 4.

The number of patients costing under BRL 500 (USD $268) is significantly different from those costing over BRL 500 between the high and medium-high income groups and the medium-low and low income groups (chi-square 14.16, df 1, $p$=0.0002), showing that the lower income groups were more likely to have incurred higher costs.

## Diagnoses

Table 5 shows the top 8 diagnoses by number of patients per income group. There is a significant difference in the number of cancer cases and the number of obstetric cases between the high and medium-high income group and the medium-low and low income group (chi-square 18.431, df 1, $p$<0.0001), indicating that the higher income groups are more likely to be treated for cancer and the low income groups are more likely to be obstetric cases.

## Discussion

Analysis of the data shows that the number of patients relative to the population is equitable. However, Brazil's universal health system accounts for less than 50 per cent of national health spending,[8] and therefore when equity is assessed excluding the beneficiaries of the private health system from the analysis, a very different picture emerges. The number of patients relative to the population that does not have access to private healthcare is highly inequitable, demonstrating that access is not proportionate to needs. The findings support the view that public-private health service segmentation in Brazil has led to the SUS providing basic services for those who cannot afford private care as well as high-cost services for those who can afford private care but whose healthcare needs require a complex mix of services that the private health sector is unable or unwilling to provide.[3,19,20] The findings also concur with other research that indicate that health service utilisation increases with increased socioeconomic status, and thus inequitable access to services.[4,6,7,21–23]

The study results indicate that patients from high-income municipalities were over-represented in an overall higher number of admissions as well as a higher use of all medical specialties (surgery, clinical, obstetric and paediatrics). Despite this group's favourable access to private healthcare, they are disproportionally likely to be have been electively admitted to hospital. This is notable by the fact that they were also more likely to have had surgical or clinical procedures and were more likely to have been treated for cancers than for obstetric conditions. Further qualitative research needs to be undertaken to interpret these findings but the results corroborate previous research that indicate that surgery and diagnostic exams are the most common procedures utilised by health insurance holders,[11] and that socioeconomic inequity is particularly prevalent at the secondary care level and above.[7] On the other end of the spectrum, the lower income patients are more likely to be female, they are more likely to be admitted by emergency care and they are more likely to have obstetric or paediatric care, all reflecting a diagnostic pattern where they are more likely to come to hospital for child birth. Nevertheless, analysis of the data also shows that the higher-income patients are likely to have incurred less cost than lower-income patients, indicating, in this case, a more equitable distribution of costs with respect to needs.

## Limitations

The results of this study are limited to the 81 per cent (n=3,624) patients resident in the Federal District. This is

because the study rests on patient proportions relative to population proportions and it was impossible to objectively define a larger population beyond the Federal District's borders. In addition, data on health plan coverage beyond the Federal District was not available. The proportions of patients from the whole sample however were similar or the same as those living within the Federal District with respect to all the variables analysed.

This study suffers from the discrepancy that the patient data is from 2013, while the socioeconomic data is from the household survey from 2011. Neither dataset could be adapted to match the other because while population data is available for 2013, health insurance coverage data has not been updated since the household survey. The patient dataset could not be taken from before 2013 either because patients' residences where only recorded starting from 2012.

Unfortunately, due to the limited scope of this study, a quantitative analysis of secondary data, qualitative speculation of the results was not possible.

## Conclusion

This study has shown that access to the University Hospital in Brasilia is not equitable when individual access to private healthcare is accounted for. The results concur with other evidence that dual access to both public and private healthcare is common, indicating an under-representation for those whose only access to healthcare is with the SUS, the reverse of what would be expected were equity concerns a guide to fair representation. Given the limited service capacity within SUS, over-use of services by those who have alternate options necessarily diminishes access for the rest.

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## PEER REVIEW

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## CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

## ETHICS COMMITTEE APPROVAL

Human Research Ethics Committee in Australia, approval number SONM32-2013.
Research Ethics Committee of Brazil (Comitê de Ética em Pesquisa), CAAE 18860113.0.0000.0030.

**Table 3: Number of admissions per medical specialty and income group**

| | Population (%) | Specialty | | | |
|---|---|---|---|---|---|
| | | **Surgery** | **Clinical** | **Obstetrics** | **Paediatrics** |
| **Number** | | 36% (n=1285) | 37% (n=1,336) | 17% (n=625) | 10% (n=377) |
| **_Income group_** | | **_% of specialty_** | | | |
| **High** | 14.4 | 20 | 22 | 19 | 27 |
| **Medium-high** | 32.6 | 26 | 26 | 19 | 21 |
| **Medium-low** | 42.6 | 45 | 41 | 44 | 38 |
| **Low** | 10.4 | 9 | 11 | 18 | 14 |

**Table 4: Proportion of patients per cost category and income group**

| Income group | Population (%) | % Under 250 BRL | % 250–500 BRL | % 500–750 BRL | % Over 750 BRL |
|---|---|---|---|---|---|
| **High** | 14.4 | 24 | 22 | 19 | 19 |
| **Medium-high** | 32.6 | 25 | 26 | 22 | 24 |
| **Medium-low** | 42.6 | 39 | 42 | 45 | 46 |
| **Low** | 10.4 | 12 | 10 | 14 | 11 |
| **% of patients per cost category** | | 25.2 | 26.7 | 26.2 | 22 |

**Table 5: Number of top eight diagnoses classifications per income group**

| Income group | Diagnosis category (ICD-10 classification) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **C00-97** | **O80-84** | G40-47 | N17-19 | K40-46 | J09-18 | K80-87 | P05-08 |
| **High** | **83** | **63** | 31 | 40 | 21 | 22 | 17 | 24 |
| **Med-high** | **151** | **81** | 33 | 25 | 28 | 23 | 28 | 22 |
| **Med-low** | **194** | **186** | 65 | 53 | 62 | 56 | 51 | 34 |
| **low** | **35** | **70** | 17 | 10 | 11 | 12 | 13 | 20 |
| **No. and % of cases** | **463 (12.8%)** | **400 (11%)** | 146 (4%) | 128 (3.5%) | 122 (3.4%) | 113 (3.1%) | 109 (3%) | 100 (2.8%) |

_International Statistical Classification of Disease categories: **C00-97 Malignant Neoplasms; O80-84 Delivery**; G40-47 Episodic and paroxysmal disorders; N17-19 Renal failure; K40-46 Hernias; J09-18 Pneumonia; K80-87 Disorders of gallbladder, biliary tract, and pancreas; P05-08 Disorders related to length of gestation and foetal growth._