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# Distribution of hospital admissions in a middle-income country of the African region

## **Etudiant**

Gaël Bryois

## **Tuteur**

Prof. Pascal Bovet

Institut universitaire de médecine sociale et préventive

## **Expert**

Prof. Blaise Genton

Centre ambulatoire des maladies infectieuses et tropicales de la PMU

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**Distribution of hospital admissions in a middle-income country of the African region**

Gaël Bryois (1), Rosalie Isnard (2), Pascal Bovet (1, 2)

1) Institute of social and preventive medicine, Lausanne University Hospital, Lausanne, Switzerland

2) Statistics Unit, Ministry of Health, Republic of Seychelles

Address for correspondence:

Prof. Pascal Bovet

Institut universitaire de médecine sociale et préventive

Biopôle 2

Rue de la Corniche 10

1010 Lausanne, Suisse

Email: [pascal.bovet@chuv.ch](mailto:pascal.bovet@chuv.ch)

## Abstract

**Introduction:** Few studies have reported the distribution of all hospital admissions at the entire country level in low and middle-income countries (LMICs). We examined this question in Seychelles, a rapidly developing small island state in the Africa region, in which access to health care is provided free of charge to all inhabitants through a national health system and all hospital admissions are routinely registered.

**Methods:** Based on all admissions to all hospitals in Seychelles in 2005-2008, we calculated the distribution of hospital admissions, age at admission, length of stay and bed occupancy (i.e. cumulated number of patients \* number of days spent in all hospitals) according to both hospital departments and broad causes of diseases (using codes of the ICD-10 classification of diseases).

**Results:** Bed occupancy was largest in the surgical wards (36.7% of all days spent in all hospitals), followed by the medical wards (24.3%), gynecology/obstetrics wards (18.4%), pediatric wards (11.2%), and psychiatric wards (7.2%). According to broad causes of diseases/conditions, bed occupancy was highest for obstetrics/gynecology conditions (19.9% of all days spent at hospital), mental diseases (8.6%), cardiovascular diseases (8.1%), upper aerodigestive/pulmonary diseases (8%), infectious/parasitic diseases (8%), gastrointestinal diseases (7.2%), and urogenital diseases (6.7%). Adjusted to 100'000 population, 153 hospital beds are needed every day, including 31 for obstetrics/gynecologic conditions, 13 for mental diseases, 12 for cardiovascular diseases, 12 for upper aerodigestive diseases, 12 for infectious/parasitic diseases, and 11 for gastrointestinal diseases.

**Conclusion:** Our findings give a good indication of the overall distribution of admissions according to both hospital departments and broad causes of diseases in a middle-income country. These findings provide important information for health care planning at the national level.

**Keywords:** Admission, burden of disease, hospital, morbidity, pattern

## Introduction

In addition to mortality data, morbidity data are important to estimate the burden of disease in the population. Hospital-based discharge data are helpful when examining morbidity parameters (1). The validity of hospital-based data to reflect the epidemiological situation is enhanced if people have easy access to health care (e.g. national health system with free access to health care for all inhabitants or situations where health insurance is mandatory to all inhabitants) and if there is a reliable national health information system whereby all hospital admissions are registered and the reported discharge diagnoses are accurate. However, the validity of hospital-based data is often low in middle-income countries (LMICs) because only small proportions of the entire population use hospital health care (because of access, availability or affordability issues) and reporting of admissions is often not comprehensive or reliable (1, 2).

The Republic of Seychelles is a rapidly developing upper middle-income country (MIC) experiencing rapid aging and epidemiologic transitions. Seychelles is one of the very few countries in the African region to have vital statistics recording all deaths occurring in the entire population. Trends in broad causes of deaths have been recently described, including the fact that stroke, cardiovascular diseases and cancers account for the large majority of all deaths (3). In addition, hospital discharge diagnoses and other information are routinely recorded for all persons admitted to all hospitals in Seychelles. Information on hospital admissions in Seychelles is particularly interesting because it potentially captures all possible hospital admissions in the entire population (because health care is provided free of charge to all inhabitants).

This study aims to examine hospital admissions according to two different perspectives: the distribution according to hospital departments and the distribution according to broad causes of diseases and conditions. Correspondingly, these data can be useful to provide information on both the epidemiological situation (i.e. overall disease patterns and burden) and to inform planning and resource allocation of health services.

## Methods

The Republic of Seychelles is located in the Indian Ocean, about 1'800 km east to Kenya. It is an archipelago of about 115 islands but approximately 90% of the population of 86'000 lives on the main island (Mahé) and 9% on two nearby smaller islands, Praslin and La Digue (4). The majority of the population is of African descent. Around 35% people are  $\geq 40$  years old and 11 %  $\geq 60$  years old.

Health care is provided through a national health system, (i.e. health care is provided free of charge to all inhabitants). Within this health system, ambulatory health care is delivered through a dense network of district health centers and stationary care (i.e. admissions to hospital) is provided mostly at the Hospital of Victoria in Mahé and in a few smaller hospitals in the three main islands. There are few private clinics which offer ambulatory health care but there is no private hospital in Seychelles so far. Secondary health care is provided only in the main hospital (intensive health care unit, hemodialysis, radiologic investigations, all birth deliveries, etc). The total expenditure for health was US\$ 712 per capita in 2009 of which 5% came from out of pocket payments (5). Health service coverage is good, e.g. 99% of births are attended by skilled health personnel and immunization for measles, DiTePer, hepatitis B and hemophilus influenza B immunization ranges between 90%-99%.

Every week, all hospitals routinely send to the Statistics Unit the lists of all admissions. An admission is defined for any person who spends at least one night in the hospital. For each admission the following information is collected: the national identity number, first name, last name, place of residence, sex, age, date of admission, date of discharge/ transfer/death and one or several diagnoses at discharge. One main diagnosis is adjudicated and accordingly coded at the Statistics

Unit. This was done by the same person (RI) during the entire study period. Diseases are coded routinely according to the special list for morbidity containing 298 codes, which is published in the 10<sup>th</sup> revision of the International Classification of Diseases (ICD 10).

In this study, we examined all hospital admissions between 2005 and 2008. We examined different variables related to hospital admissions and calculated bed occupancy (i.e. the number of beds used per day on a yearly basis) according to both hospital departments and broad causes of diseases.

## Results

When looking at hospital admissions according to hospital departments, an average of 12'363 admissions was recorded every year in all hospitals between 2005 and 2008 (**Table 1**). The largest number of admissions was observed in the surgical wards (average of 4127 admissions per year), followed by the medical wards (2717), the gynecology and obstetrics wards (1925), the pediatric wards (1579), the psychiatry wards (452). The average length of stay of hospital admissions ranged between 4.3 and 4.6 days in the surgical, medical and gynecology and obstetrics departments, respectively, and was 3.4 days in the pediatric department and 7.8 days in the psychiatry department. In terms of bed occupancy (i.e. number of patient\*days), the largest share was found for the surgical department (36.7% of all days spent in all hospitals), followed by the medical department (24.3%), the gynecology and obstetrics department (18.4%), the pediatric department (11.2%), and the psychiatric department (7.2%). The average age of patients was 54.2 years for admission in the medical wards, 42.5 years in the surgical wards, 36.5 years in the psychiatry wards, 26.7 years in the gynecology and obstetrics department and 3.6 years in the pediatric department.

**Table 2** shows the overall distribution of all hospital admissions according to broad categories of diseases and conditions, irrespective of medical departments (e.g. an admission for a cardiovascular condition can occur in any department). Between 2005 and 2008 there was a mean of 10'941 admissions per year for whom a diagnosis was available. The largest number of admissions was attributable to gynecology and obstetrics conditions (2210) followed by upper aerodigestive and pulmonary diseases (1026), infectious and parasitic diseases (979), gastrointestinal diseases (920), cardiovascular diseases (912), urogenital diseases (813), mental diseases (542). The overall mean duration of hospital stay was 4.3 days. The largest proportion of bed occupancy is represented by obstetrics and gynecology conditions (19.9%) followed by mental diseases (8.6%), cardiovascular diseases (8.1%), upper aerodigestive/pulmonary diseases (8%), infectious/parasitic diseases (8%), gastrointestinal diseases (7.2%), urogenital diseases (6.7%). The overall mean age at admission was 37 years. Of note, figures on admissions can slightly overestimate the number of different individuals admitted to hospital since some patients are recorded several times when they are transferred (e.g. from intensive health care to medical wards) between wards.

In other terms, an average of 153 beds per 100'000 population are needed every day during the entire year including 31 beds for gynecology and obstetrics conditions, 13 for mental diseases 13 for cardiovascular diseases, 12 for upper aerodigestive diseases, 12 for infectious/parasitic diseases, 11 for gastrointestinal diseases.

## Discussion

Because of free access to health care to all inhabitants and a good health information system in Seychelles (including a register of all hospital admissions), our study provides a unique opportunity to observe the distribution of hospital admissions according to two different perspectives: hospital departments which provide information on both the volume of hospitalization and organization of health departments (number of doctors, nurses) and the pattern of morbidity in the country with the distribution of broad causes of diseases.

Overall, our study shows that the largest numbers of admissions occurred in the surgical department (36.7% of all admissions), followed by the medical department (24.3%), the gynecology and obstetrics department (18.4%), the pediatric department (11.2%) and the psychiatry department (7.2%). With regards to broad causes of diseases, and adjusted to 100,000 population, 153 hospital beds and related resources are needed every day for all conditions, including 31 beds for the management of gynecology and obstetrics conditions, 13 for mental diseases 13 for cardiovascular diseases, 1 for upper aerodigestive diseases, 12 for infectious/parasitic diseases, 11 for gastrointestinal diseases. These findings have important significance for health care policy. Of note, malaria and several other tropical diseases are inexistent in Seychelles, and the prevalence of HIV is lower than 2% in the general population.

A few main findings can be underlined. First, the surgical wards accounted for the largest number of admissions followed by the medical wards and the gynecology and obstetrics wards. This is different, for example, from Southern Soudan where the pediatric ward represents the highest number of admissions (6). This reflects both a different population distribution (older population in Seychelles than Soudan in this example) and a different epidemiologic situation (more chronic diseases in Seychelles and more infectious diseases in Sudan). Second, the large number of admissions in Seychelles was related to gynecological and obstetrical conditions. This is consistent with the still fairly young population in Seychelles (as compared to high income countries) and the subsequent large number of births (around 1500 births for 600 deaths per year; 65% of the population is aged <40 years). Third, a large number of admissions was related to infectious diseases, as reflected by the fact that a majority of diseases are of infectious origin within the ICD-10 categories of upper aerodigestive and pulmonary diseases, gastrointestinal diseases, and infectious diseases. An important burden of infectious diseases is further supported by the fairly young age of admissions overall in Seychelles. Forth, chronic conditions such as mental health, cardiovascular diseases, cancers and diabetes accounted for a substantial number of bed occupancy (respectively 8.6%, 8.1%, 6.3% and 3.1% of all days spent in all hospitals). Similar figures related to the hospital burden of non communicable diseases were found in some other developing countries (7-9). The substantial burden of chronic conditions, including cardiovascular diseases, diabetes and cancers in Seychelles is consistent with late epidemiological transition. It stresses the need for appropriate human resources, structures and equipment to handle these diseases.

Few data on health care utilization are available in LMICs and several contingencies further limit comparison of data between LMICs. In particular, few LMICs offer universal access to health care. In countries which do not rely on universal access to health care, hospital data may thus disproportionately represent severe conditions and/or utilization of health care by a minority of wealthy people who can afford expenses related to hospital admissions or people who have diseases for which health care is subsidized by government or other funding agencies (e.g. HIV, hospitals for civil servants, etc). Also, health care in some LMICs largely rely on private hospitals from which data may not be available for analysis. Furthermore, studies at the entire country level hardly exist in LMICs. They are often limited to a few public hospitals in main cities or only include selected hospital departments (and which may not take in account, for example, birth deliveries) None withstanding these limitations, a large burden of infectious diseases has been noted, not unexpectedly, in South Africa (10, 11), Nigeria (12), Bangladesh (13) and South Ethiopia (14).

However, cardiovascular diseases were also been reported as a leading cause of hospital admissions in high income countries such as Israel (15), but also in LMICs such as South Africa (16) and Nigeria. For example, non communicable diseases accounted for as many as 60.1% of all hospital admissions in the medical wards in Nigeria (17, 18). Chronic conditions such as hypertension, diabetes, asthma accounted for nearly 30% of all admissions in a South African rural hospital (16). In Zimbabwe infectious diseases and cardiovascular diseases accounted for 50% of all admissions in the medical wards (19), which emphasizes the typical double burden of disease in LMICs. Information on the

distribution of admissions according to both hospital departments and broad causes of diseases provides useful information to inform planning health services, e.g. with regards to numbers of specialists needed, resources and training needed to meet diagnosis and treatment of patients admitted to hospital, and prevention programs.

From a users' perspective, we can estimate that up to 13% of the total population of Seychelles attends a hospital each year (assuming that every hospital admission represents a different person), which is less than 30% found, for example, in Hunter, Australia (20). However, these comparisons have to be made with caution because of different age distributions in different countries and different underlying health information systems.

This study has a number of limitations. First, accuracy of diagnoses of patients admitted at hospital depends on the availability of appropriate investigation means at hospital level. Diagnostic capacity is fairly advanced in Seychelles (e.g. most important blood tests, CT scan, MRI, echography are routinely available). Furthermore, most broad causes of diseases can be reliably assessed by simple routine clinical or laboratory tests. Second, it is challenging to adequately code a sole main diagnosis in presence of several co-morbidities although this issue mainly occurs for aged patients in medical wards (a minority of all patients overall). Third, there was no formal validation of discharge diagnoses; however only one person handled the database of hospital admissions during the entire study, ensuring internal consistency in diagnoses recorded over time, and this person had decade long experience. Finally, the hospital-based burden of morbidity described in this study obviously does not include patients managed through ambulatory care or sudden deaths which occurred outside of hospital.

The study also has major strengths. First, access to health care is free to all inhabitants in Seychelles which allows utilization of hospital health care for all patients who need it. Second, diagnoses for all hospital admissions in the country have been routinely compiled by the Ministry of Health for several years and the health information system is well functioning. Finally, accuracy of diagnoses is fair for most patients in view of sufficient medical staff in hospitals and the availability of reasonably advanced diagnostic equipment.

## **Conclusions**

Although mortality in Seychelles is largely dominated by chronic diseases (3), the overall burden of hospital admissions is driven by a broad mix of surgical conditions, child and maternal health care conditions, communicable diseases and non communicable diseases. In the favorable context of free access to health care to all inhabitants and complete recording of diagnoses for all hospital admissions in Seychelles, these hospital-based results provide a good indication of the burden and pattern of morbidity in a middle-income country. These data are useful to guide planning of health services, including the need for underlying structural, equipment and human resources to address this burden.

**Table 1. Distribution and characteristics of all hospital admissions according to hospital departments, Seychelles, 2005-2008**

Hospital/ward	Admissions per year	Days in hospital	Patient-days	Patient-days (%)	Age at admission (years)
VH - ICU	302	3.6	1'087	2.2	48.2
VH – Gynecology/obstetrics	1'875	4.6	8'625	18.4	26.7
VH - Medical wards	2'732	4.3	11'748	24.3	54.2
VH - Surgical wards	4'127	4.3	17'798	36.7	42.5
VH - Pediatric wards	1'688	3.4	5'739	11.2	3.6
VH - Psychiatry wards	505	7.8	3'939	7.2	36.5
Praslin hospital	875	2.7	2'363	4.4	36.3
La Digue hospital	259	2.1	544	1.1	37.9
<b>Total</b>	<b>12'363</b>	<b>4.2</b>	<b>51'925</b>	<b>100</b>	<b>35.3</b>

VH: Victoria Hospital



**Table 2. Distribution and characteristics of all hospital admissions according to ICD10 disease categories, Seychelles 2005-2008**

ICD10	Category	Admissions per years	Admissions (%)	Days in hospital	Patient- days	Patient- days (%)	Beds per day needed for 100'000 population	Age at admission (years)
A-B	Diarrhea, gastroenteritis	435	4.0	2.6	1'109	2.4	3.6	11.9
A-B	Other viral infections	270	2.5	2.6	696	1.5	2.3	18.5
A-B	Other A-B	274	2.5	7.0	1'920	4.1	6.2	33.7
C-D	Cancer	527	4.8	5.6	2'950	6.3	9.6	53.0
E	Diabetes	256	2.3	5.7	1'470	3.1	4.8	56.5
E	Other endocrinol. disorders	49	0.4	3.9	191	0.4	0.6	57.3
F	Mental diseases	542	5.0	7.5	4'065	8.6	13.2	37.7
G	Neurological diseases	237	2.2	2.9	679	1.4	2.2	37.8
H	Hearing loss, retina, etc	182	1.7	3.4	618	1.3	2.0	40.4
I	Cardiovascular diseases	912	8.3	4.2	3'831	8.1	12.5	61.4
J	Upper aerodigestive & pulmonary	1'026	9.4	3.7	3'784	8.0	12.3	28.5
K	Gastrointestinal diseases	920	8.4	3.7	3'395	7.2	11.0	41.2
L	Skin	434	4.0	5.9	2'569	5.4	8.4	43.4
M	Ostearticular	195	1.8	3.9	756	1.6	2.5	43.7
N	Urogenital	813	7.4	3.9	3'145	6.7	10.2	43.2
OPQ	Obstetrics and gynecology	2'210	20.2	4.2	9'383	19.9	30.5	26.5
R	Other symptoms	230	2.1	2.3	539	1.1	1.8	30.1
S	Fractures, injuries	427	3.9	6.1	2'586	5.5	8.4	39.0
T	Poisoning, other external causes	338	3.1	2.5	854	1.8	2.8	28.5
Z	Specific procedures	542	5.0	4.0	2'166	4.6	7.0	37.0
Z	Other Z	122	1.1	2.7	328	0.7	1.1	35.5
	Total	10'941	100.0	4.3	47'046	100.0	153.3	37.0

## Reference List

1. Mathers C. Uncertainty and data availability for the global burden of disease estimates 2000-2002. Geneva: World Health Organization; 2005.
2. Hansell A, Bottle A, Shurlock L, Aylin P. Accessing and using hospital activity data. *Journal of Public Health Medicine* 2001;23(1):51-6.
3. Stringhini S, Sinon F, Didon J, Gedeon J, Paccaud F, Bovet P. Declining Stroke and Myocardial Infarction Mortality Between 1989 and 2010 in a Country of the African Region. *Stroke* 2012.
4. Organization WH. Country Cooperation Strategy at a glance: Seychelles. In. Geneva: World Health Organization; 2009.
5. WHO. World Health Statistics 2012. Geneva; 2012.
6. Ayrton J AD, Kuron LD. A retrospective analysis of mortality distribution in Juba Teaching Hospital, Southern Sudan. *Southern Sudan Medical Bulletin* 2009;2(1):pp. 3-7.
7. Boutayeb A, Boutayeb S. The burden of non communicable diseases in developing countries. *Int J Equity Health* 2005;4(1):2.
8. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 2006;3(11):e442.
9. WHO. Global Status Report on Noncommunicable Diseases 2010. Geneva: World Health Organization; 2010.
10. A N. Trends in Adult Medical Admissions at Tambo Memorial Hospital, Gauteng, between 2005 and 2007. Johannesburg: University of the Witwatersrand; 2009.
11. Marszalek J, De villiers P. Morbidity Profile of admissions to GF Jooste Hospital, Manenberg, Cape Town. *SA Fam Pract* 2006;48(6):15-15e.
12. Ogun SA, Adelowo OO, FAMILONI OB, Jaiyesimi AE, Fakoya EA. Pattern and outcome of medical admissions at the Ogun State University Teaching Hospital, Sagamu--a three year review. *West Afr J Med* 2000;19(4):304-8.
13. Ahmed S, Siddique AK, Iqbal A, Rahman FK, Islam MN, Sobhan MA, et al. Causes for hospitalizations at upazila health complexes in Bangladesh. *J Health Popul Nutr* 2010;28(4):399-404.
14. Ali E, Woldie M. Reasons and outcomes of admissions to the medical wards of jimma university specialized hospital, southwest ethiopia. *Ethiop J Health Sci* 2010;20(2):113-20.
15. Stein GY, Zeidman A. Trends in admissions to internal medicine wards in a community hospital in Israel. *Eur J Intern Med* 2006;17(4):281-5.
16. Dean MP, Gear JS. Medical admissions to Hillbrow Hospital, Johannesburg, by discharge diagnosis. *S Afr Med J* 1986;69(11):672-3.
17. Unachukwu CN, Agomuoh DI, Alasia DD. Pattern of non-communicable diseases among medical admissions in Port Harcourt, Nigeria. *Nigerian journal of clinical practice* 2008;11(1):14-7.
18. Ike SO. The pattern of admissions into the medical wards of the University of Nigeria Teaching Hospital, Enugu (2). *Niger J Clin Pract* 2008;11(3):185-92.
19. Mudiayi TK, Onyanga-Omara A, Gelman ML. Trends of morbidity in general medicine at United Bulawayo Hospitals, Bulawayo, Zimbabwe. *Cent Afr J Med* 1997;43(8):213-9.
20. Service HNEAH. Health in Hunter New England 2005; 2005.