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**SERIES OF AVOIDABLE
HOSPITALIZATIONS AND
STRENGTHENING
PRIMARY HEALTH CARE**

**Primary Care Effectiveness and
the Extent of Avoidable
Hospitalizations in Latin
America and the Caribbean**

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Abstract

This study combines detailed datasets on 39.1 million hospital discharges in six countries in Latin America and the Caribbean with summary statistics for the remaining countries in the region in order to estimate the number and economic effect of avoidable hospitalizations for ambulatory care sensitive conditions in the region. We estimated the number of avoidable hospitalizations to be in a range between 8.1 and 10 million, with both visible costs of attention and hidden costs of opportunity representing as high as 2.5% of the reported total health expenditure in 2009. Among countries with low coverage and high poverty levels, these costs assume an even higher value in terms of wasted labor usage and resources spent. It briefly examines some policy implications of using data on hospitalizations for ambulatory care sensitive conditions as a policy instrument for measuring the health system performance.

JEL Classification: I, I1, I11, I12, I18

Key Words: Developing Countries, Primary Care, Avoidable hospitalizations, Prevention and Control, Chronic Diseases, Latin America and the Caribbean.

1. Introduction

The renewed interest of LAC countries around the need to strengthen primary health care to address the non-communicable diseases (NCD's) epidemic has strengthened the interest in an indicator that correlates with access, quality and use of primary health care services. Ambulatory care sensitive conditions (ACSC) – those conditions that could theoretically be managed at primary-care level – have been used in studies in a growing number of countries.¹

Most of these studies correlate quality and access of primary care with hospitalizations for ACSC, which are commonly referred to as avoidable hospitalizations. However, no studies have presented a broader cross-country perspective on the magnitude of avoidable hospitalizations or the costs associated with them.

This paper relies on a series of national reports to estimate the number and cost of avoidable hospitalizations for ACSC in Latin America and the Caribbean (LAC), and it briefly examines some policy implications of using this indicator as a public policy instrument for measuring health system performance. Misdirected care describes the waste generated by unnecessary procedures and emphasis on curative care, instead of preventive care.

2. Primary health care in a context of epidemiological transition in LAC

Most countries in LAC are experiencing a rapid demographic and epidemiological transition leading to a growing prevalence of NCDs, notably diabetes, cardiovascular conditions and cancer. This situation can be explained in part by the adverse effects of urbanization and development, leading to growing exposure to risk factors such as unhealthy diets, reduced physical activity, the use of tobacco and alcohol, and obesity.² Inadequate access to high quality preventive health care services is another important contributing factor to the growing burden of chronic disease.

¹ Billings et al (1993); Caminal and Casanova (2003); Guanais and Macinko (2009); Mendoça et al (2011)

² Glassman et al (2010)

Chronic diseases are already the main cause of death and disease in LAC, accounting for 68 percent of all deaths and 60% of disability-adjusted life years (DALYs).³ Cardiovascular diseases alone are responsible for 35 percent of all deaths in the region, with cancer following as the second cause of death in the Americas, killing approximately 1.15 million people in 2005.⁴

Also, it also has been documented that chronic diseases affect all population groups, though their impact is much larger on the poorest, as they suffer from access restrictions, lower use, greater prevalence of risk factors and limited access to detection and treatment services.⁵

It is in this context that the role of primary health care in disease prevention should be highlighted. Some characteristics that are inherent to primary health care have a greater potential to reduce disease and, consequently, the number of hospitalizations. Wider coverage and access to primary health care has been linked to better health results as long as prevention, care, cure and rehabilitation actions are guaranteed. Several studies suggest that an increase in preventive practices may lead to a reduction in the number of hospitalizations.⁶

Some LAC countries have adopted family-oriented health services, such as Brazil's flagship Family Health Program, as a way to increase access and coverage. Besides ensuring the provision of services, many of these programs seek to guarantee health care continuity. Guaranteeing health service access and continuity — understood as a primary-care attribute — has had a positive impact on the state of health and has translated into declining hospitalization rates.⁷ Family-centered and community-oriented primary health care has brought positive overall results while care continuity has helped to reduce hospitalization rates for chronic diseases within the subset of ACSC.⁸

Coordination between the different levels of health care is another factor that seems to be associated with lower hospitalization rates. Because primary health care should be the first point of contact with the health system, primary care health providers are expected to encounter different types of pathologies that must be treated at different levels of health care.

³ Panamerican Health Organization (2007)

⁴ Panamerican Health Organization (2008)

⁵ Jones et al (2012); Fleischer et al (2005)

⁶ Falik et al (2001); Mendoça et al (2011) ; Lavoie (2011)

⁷ Guanais and Macinko (2009)

⁸ Weinberger et al (1996)

3. Primary Care and Ambulatory Care Sensitive Conditions

To measure the effectiveness of primary care, it is necessary to clarify the way primary care can help to improve overall health results and hence reduce inpatient hospital usage. Several mechanisms have been considered: first, those related to simple access to care (coverage of hospitals, density of physicians, geographical barriers, etc); second, the scope of provided care, meaning its coordination with the other levels of attention and the breadth of such attention; and finally, the mechanism must to be coherent with the epidemiological profile of the population, its distribution and its socioeconomic and cultural characteristics.⁹ This view has been adopted by the World Health Organization, which recommends the implementation of strong schemes of first level care to meet health needs.¹⁰

The methodology of hospitalizations for ACSC assumes that timely and effective primary care may reduce the frequency of hospital admissions for several diseases or even eliminate such admissions. It is possible to track the overall effectiveness of primary attention provided by a specific country or geographical region by measuring the impact of these conditions related to the total admissions. This method has been used to monitor the performance of health systems in the United States and in some European countries and is based on a wide and growing body of literature.¹¹ For Latin American countries, however, and for developing countries in general, this thesis has been insufficiently tested.¹²

A condition may be identified as sensitive to primary care in several ways.¹³ For some diseases, early intervention precludes onset and eventual hospitalization; such is the case of vaccine-preventable diseases (hepatitis B, measles). A second group includes mostly acute conditions that respond to timely out-patient treatment and early diagnosis, such as gastroenteritis and dehydration. Lastly, for some acute and chronic conditions (diabetes, congestive heart failure, malnutrition) the occurrence and severity of hospitalizations, as well as their derived complications, may be decreased by applying effective schemes of prevention and monitoring.

⁹ Gill and Mainous (1998)

¹⁰ Bodenheimer et al (2002)

¹¹ World Health Organization (2008); Billings et al (1993); Weissman et al (1992)

¹² Billings et al (1993); Macinko et al (2011)

¹³ Caminal and Casanova (2003)

The use of a previously compiled list of ACSCs is advisable when a comprehensive analysis of avoidable hospitalizations is performed, and particularly when several countries are compared.¹⁴ The process of compiling the list, however, poses several challenges, as its validity changes depending on the specific country to which it is applied. The last available study of the Latin American region was performed in 2009 for Brazil and it has been used as the frame of reference for the analysis.¹⁵

Hospital discharges at national or regional levels are the preferred source for measuring the level of ACS hospitalizations. However, the availability of data is limited and most cases are complicated by issues related to quality and coverage. In countries with public health systems, universal coverage and a centralized budget, relevant databases are more accessible. Collection and standardization are far more complex in countries with private insurance-based mixed systems.

4. Study Data and Method

This study relies on detailed data on hospital discharges in Argentina, Colombia, Costa Rica, Ecuador, Mexico and Paraguay, combined with summary data published by international organizations. The detailed data were provided by the respective ministries of health and sanitary authorities for national studies commissioned by the Inter-American Development Bank. The available datasets contain, at a minimum, individual information on age, sex, geographical origin and diagnosis (following the ICD-10 third revision), although the variables change according to country.

The scope and time range of the information varies. For Argentina, the database was provided by the Ministry of Health for all events that required hospitalization in the public network. In Colombia the source was the National Individual Registry of Care (RIPS), which compiles the discharges reported by every hospital or center duly obligated to do so. In Costa Rica the data comes from the Caja Costarricense de Seguro Social, the publicly managed and universal social security insurer. In Ecuador the source was the Yearbook of Hospital

¹⁴ Weissman et al (1992);

¹⁵ Alfradique et al (2009);

Discharges, published by the National Institution of Statistics, with national coverage. Data of Mexico comes from the public social security insurer (IMSS), that represents more than half of the population. Finally, for Paraguay the Ministry of Health made available the database of hospital discharges from 2001 to 2008, which covers the population without health coverage.

The construction of the indicator of avoidable hospitalization for ACSC was based on a list that was adapted for the Brazilian case by a group of experts.¹⁶ In most cases, an additional revision of the list was performed in order to match the codes with those registered in the databases. The original Brazilian study identified 20 groups of conditions mostly ICD-10 codes. For simplicity, we used a 3-digit coding of the previously identified conditions, which include the overall conditions referred in the Brazilian case. Twelve of those groups applied to the entire population, while eight applied for subsets of ages (e.g. only children).

Estimation for the remaining LAC countries for which hospital data was not available required a series of steps, briefly described here. We used a two-step approach in which avoidable hospitalizations were estimated on the basis of total hospital usage. This indicator (originally expressed as discharge rates per 100.000 inhabitants) is not available for most countries, so it had to be imputed from socioeconomic and health-related data of OECD countries, where the actual usage is reported.

We started by aggregating the total hospital discharges for Latin American countries, as the indicator of ACS is computed using total inpatient usage. An imputation was performed for countries that do not disclose this information, replicating the relationship seen in 34 OECD-member countries between hospital discharges rates (a percentage of hospitalizations over population) and a set of relevant variables. The sources for this segment are the official databases of the World Health Organization, OECD and the World Bank. With this information a panel dataset was constructed from 2001 to 2009, using the estimators of a random-effects regression to fit the missing values¹⁷. The imputation model follows the form

$$U_{it} = \beta_0 + \beta_1 \log I_t + \beta_2 \text{pop65}_t + \beta_3 \text{lifexp}_t + \beta_4 \text{beds}_t + \alpha_i + \varepsilon_{it}$$

¹⁶ Ibid

¹⁷ The random effects model was chosen based on the outcomes of two tests: First a Hausmann test that rejected the hypothesis of no correlation between the unique errors α_i and the regressors x_{it} . The second test applied was a Breusch-Pagan Lagrange Multiplier (LM), which tracks significant differences across individuals (countries in this case). The null hypothesis of equality between countries (equal variances of residuals) is rejected, so an OLS regression is not applicable. Green (2003)

where U_{it} is the imputed usage, expressed as the percentage of discharges over the population by year and country, X_{it} is a set of relevant variables (log of per capita income, life expectancy in years, % population older than 65 years and hospital beds per 1.000 inhabitants), α_i is the unique error term, variable over time but constant over countries, and ε_{it} the so-called within-error. Exhibit 1 shows the outcomes of both fixed and random effects.

Exhibit 1. Coefficients imputation model for discharges; fixed and random effects

Variable	Fixed effects	Random effects
Log Income	0.02568938**	0.01741657*
%pop > 65y	0.3470333**	0.39506442***
Life expectancy	-0.00148758	-0.00136707
Hospital Beds per 1.000 inhab.	0.00337148**	0.00357892***
Constant	-0.04627754	0.01702341

legend: * p<0.05; ** p<0.01; *** p<0.001

To impute the rate of avoidable hospitalizations, we used parameters taken from the six countries where data is available, adjusting the incidence by specific age groups, to generate an age-standardized rate. An interval of confidence was estimated, designed to account for idiosyncratic factors and non-observable factors. This exercise does not aim to produce a point estimation but rather an interval where the actual number may be placed with reasonable likelihood.

An event of avoidable hospitalization mainly brings about two costs: the visible costs of attention and the hidden costs of opportunity.¹⁸ For the valuation of hospitalization costs we took as benchmark the reported unitary costs of Brazilian public care in 2009 (IBGE), adjusting by purchasing power parity for every country included in the group of study, converting to the average exchange rate in US dollars of that year. The opportunity cost, on the other hand, is defined as the value of the output ceased to produce. It is assumed that the average length of hospitalization (in days) is a proxy of the number of the productive lost days by the health event. The population estimated in the ACS section was standardized according with the demographic breakdown reported in the labor statistics for every country, valuing the lost day as the GDP per capita computed for working days in a year. The data sources of health expenditures, labor

¹⁸ Weissman et al (1992)

participation, employment and average exchange rates are The World Bank and The World Health Organization.

5. Results: Trends in Avoidable Hospitalizations

A total of 39.1 million hospital discharges were available for examination, and 14.3 percent of those matched the label of Ambulatory Care Sensitive Conditions.¹⁹ The average rate for the entire period ranges between 10.8 percent (for Costa Rica) and 21.6 percent (for Colombia). Exhibit 1 shows the main indicators derived from the discharges data available.

¹⁹ In the sample Mexico has 21 million of discharges, which represents 53% of the total sample. In order to avoid a bias towards the Mexican case, the findings are presented by country and not aggregated.

Exhibit 2. Main indicators Ambulatory Care Sensible conditions databases selected countries (average 2001-2009).

VARIABLES	Argentina₁	Colombia₂	Costa Rica₃	Ecuador₄	Mexico₅	Paraguay₆
Total studied discharges (millions)	1.97	2.65	4.63	6.80	21.83	1.18
Number of years available	1	1	10	8	5	8
% ACSC discharges/total discharges	18.2%	21.7%	10.8%	17.3%	12.7%	18.7%
Average age ACSC (in years)	34.5	37.4	35.2	30.2	36.4	26.6
Average length stay at hospital (in days)	6.8	5.4	7.1	5.0	4.6	4.9
% participation per group of conditions						
ACS						
Vaccine-preventable diseases	0.3%	0.2%	0.6%	0.3%	0.1%	0.3%
Avoidable conditions	1.3%	0.8%	1.7%	3.7%	1.0%	2.7%
Infectious gastroenteritis and complications	21.8%	7.5%	12.3%	29.2%	13.9%	26.9%
Anemia	0.1%	0.3%	0.6%	0.2%	0.2%	0.0%
Nutritional deficiencies	0.9%	0.4%	0.5%	0.8%	0.6%	1.7%
Ear, nose and throat infections	2.3%	2.7%	3.9%	2.2%	4.4%	1.7%
Bacterial pneumonia	17.8%	19.3%	13.5%	15.3%	11.6%	24.6%
Asthma	4.2%	4.3%	10.7%	1.9%	4.7%	2.6%
Lower Airways Diseases	12.5%	15.5%	15.9%	4.3%	9.7%	8.1%
Hypertension	4.7%	2.6%	2.7%	4.6%	3.2%	4.7%
Angina pectoris	1.8%	2.5%	1.8%	0.7%	1.3%	0.2%
Congestive heart failure	3.2%	2.9%	0.6%	2.8%	1.9%	1.4%
Cerebrovascular Diseases	2.5%	2.1%	1.8%	3.6%	2.6%	1.9%
Diabetes mellitus	4.2%	4.1%	7.4%	7.2%	16.2%	5.0%
Epilepsy	1.6%	2.1%	1.7%	1.2%	2.1%	0.8%
Kidney infection and urinary tract	7.8%	15.7%	6.9%	8.6%	6.5%	6.4%
Infection of skin and subcutaneous tissue	5.6%	10.0%	7.6%	4.2%	4.7%	4.8%
Inflammatory diseases of female pelvic organs	1.3%	1.4%	3.2%	1.6%	2.4%	1.4%
Gastrointestinal ulcer	3.1%	2.9%	4.0%	3.2%	5.2%	1.6%
Diseases related to childbirth and prenatal	2.9%	2.7%	2.5%	4.3%	7.2%	3.1%

Notes:

1. Year: 2009

2. Year: 2008

3. Average 1997-2010

4. 2001-2010

5. 2004-2008

6. 2001-2008

The breakdown by groups reflects the epidemiologic profile of each country, as well as the main features of the population covered by the hospitals. The incidence in some countries may be greater because of their younger and relatively more vulnerable populations, reflecting not only demographic traits but also the socioeconomic profile of the population covered by the

system. It is expected that countries with higher economic development and older population have a greater incidence of chronic diseases, while countries with lower income may still reflect a sizeable impact of communicable diseases. However, the opposite does not always hold true, because a low proportion of AH does not necessarily imply that the preventive services are working properly. It may be caused by low access in both primary care and hospital settings²⁰.

When it comes to ACS hospitalizations, the available data agrees with some of the former premises. The countries with the highest impact of avoidable hospitalizations by chronic diseases are Mexico, Costa Rica, Argentina and Colombia, while Ecuador and Paraguay (with lower income) show a larger effect of preventable conditions. Some other outcomes are less obvious: the most important set of conditions in Argentina, Ecuador and Paraguay are those related to infectious gastroenteritis, with 33, 27 and 22 percent of all ACS reported cases respectively. For Colombia and Costa Rica, the group with the highest percentage (averaging 15 percent) is “lower airways diseases,” which comprises diagnoses such as bronchitis and emphysema. Mexico shows a far larger effect of diabetes (16 percent) than the other countries (average of 5 percent). Overall, conditions such as kidney and urinary infections and skin infections have shown an upward trend, displacing vaccine-preventable and avoidable conditions.

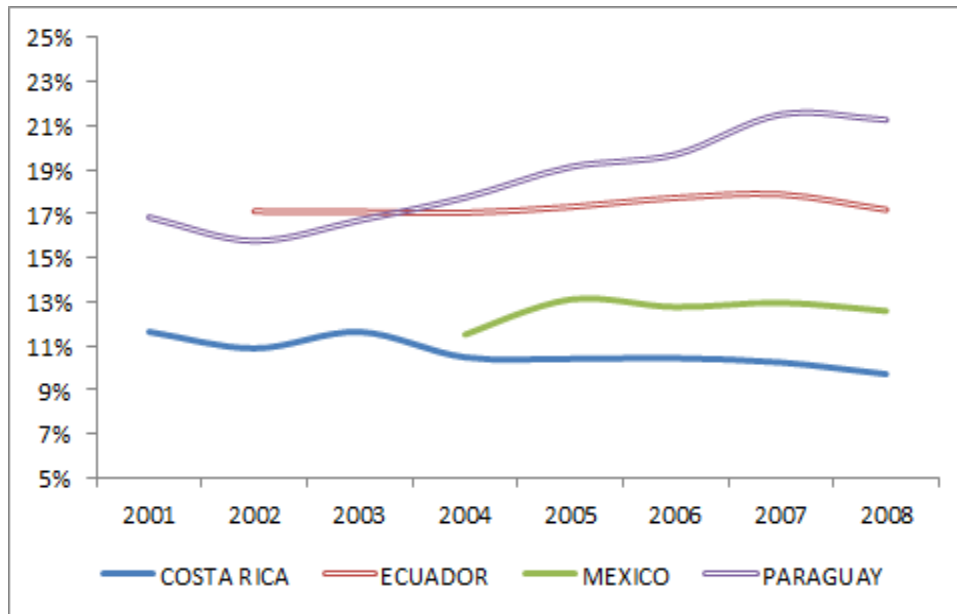
From the data at hand it cannot be determined that the impact of ACS has increased in the region, but the observed trends of chronic disease prevalence may point in that direction.²¹ We had available time-series data from Costa Rica, Ecuador, Mexico and Paraguay, showing the trend of ACS hospitalizations from 2001 to 2008²². A sustained increase in the indicator of ACS hospitalizations was observed in Paraguay, which in 2008 reached a peak of 21.5 percent, up from 17 percent reported in 2002. Both Ecuador and Mexico showed a rather stable rate of the indicator (averaging 17% and 13% respectively), whereas Costa Rica actually shows a decrease in the rate of hospitalizations during the period (see exhibit 3).

²⁰ Macinko, Dourado and Guanais (2011)

²¹ Glassman et al (2010)

²² For Mexico from 2004

Exhibit 3. Evolution ACS rate in Mexico, Costa Rica, Ecuador and Paraguay (*)



Source:
Note: Countries with Yearly Data available

6. Projections for LAC

At a 95 percent confidence level, a range between 8 and 10 million avoidable hospitalizations for the region of Latin America and the Caribbean was estimated for 2009, with a mean of 9.1 million hospitalizations. This corresponds to a range between 16.8 and 21 percent of total discharges, and a mean of 19 percent. The indicator mimics the trends found in the sample of countries with actual data, and does not include information at a national-regional level (see section 3). The nominal amount of hospitalizations is greatly affected by the outcome of Brazil, given its share of population within the region, where avoidable hospitalizations still remains at high levels, in spite of a recent decline associated with expansion of primary care.²³

As previously mentioned, the ACS hospitalizations cause 2 types of cost: direct and indirect (section 3). We estimated the sum of these two components to represent as high as 2.4% of the public expenditure health reported for that year²⁴, and 1.5% of the total health expenditure (3.7 billion dollars in 2009). Among countries with low coverage and high poverty levels, where

²³ Alfradique et al (2009); Macinko et al (2010)

²⁴ WHO

public health expenditure is typically low, these costs assume an even higher value in terms of wasted labor usage and resources spent. The estimated results of avoidable hospitalizations and costs associated with them are presented in exhibit 3.

Exhibit 4. Estimated proportion of ACSC and costs.

Country	% ACS/Total discharges (average interval)	Total cost ACS/GDP	Total cost ACS/total health expenditure	Total cost / total public expend. health
Argentina	18.2%	0.1%	1.0%	1.6%
Bahamas	16.0%	0.0%	0.7%	1.5%
Barbados	16.3%	0.1%	1.2%	1.8%
Belize	17.7%	0.1%	2.4%	3.2%
Bolivia	18.4%	0.2%	3.3%	5.1%
Brazil	21.9%	0.1%	1.4%	3.1%
Chile	16.5%	0.1%	0.9%	1.9%
Colombia	21.7%	0.1%	2.2%	2.6%
Costa Rica	10.8%	0.1%	0.6%	0.9%
Dominican Republic	17.3%	0.1%	1.7%	4.2%
Ecuador	17.3%	0.1%	1.5%	3.2%
El Salvador	18.2%	0.1%	2.0%	3.4%
Guatemala	20.7%	0.2%	2.4%	6.6%
Guyana	16.7%	0.2%	2.7%	3.0%
Haiti	18.2%	0.5%	7.9%	35.8%
Honduras	18.6%	0.2%	2.7%	4.8%
Jamaica	17.5%	0.1%	2.6%	4.6%
Mexico	12.7%	0.0%	0.4%	0.9%
Nicaragua	17.9%	0.2%	2.1%	3.7%
Panama	16.8%	0.1%	0.9%	1.2%
Paraguay	14.1%	0.1%	1.6%	3.6%
Peru	16.8%	0.1%	1.8%	3.1%
Suriname	16.7%	0.1%	1.8%	3.7%
Trinidad and Tobago	15.1%	0.1%	0.9%	1.9%
Uruguay	20.0%	0.1%	1.7%	2.7%
Venezuela	16.5%	0.1%	1.2%	3.0%
TOTAL	19.0%	0.1%	1.2%	2.4%

Source: The World Bank. Countries in italics have an observed rate of ACS

The cost estimation takes into account general availability of medical care, percentage of active and working population, per capita production values, purchasing power parity rates

among other variables. Most of the costs attributable to ACS hospitalizations come from the value of care itself (direct cost), rather than the loss of working days. However, this indirect cost increases as per capita income and employment rates grew larger.

7. Discussion

This study is a first attempt to estimate the proportion of avoidable hospitalizations for ambulatory care-sensitive conditions out of the total number of hospitalizations, as well as their cost to Latin America and the Caribbean. An average of 9.6 million hospitalizations each year can be categorized as preventable, or sensitive to ambulatory care that is timely, adequate, and accessible. This corresponds to an annual cost equivalent to 2.4% of total public health expenditure. This estimate has very important policy implications, suggesting that additional funds invested for strengthening integrated primary health care services will likely pay themselves off by reducing costs of treatment for avoidable hospitalizations, increasing efficiency of the labor force, and improving overall population health status.

An analysis between the association between resources invested in the expansion of primary health care and resources saved with the decrease of avoidable hospitalizations is beyond the scope of the current study. Therefore, in terms of both research agenda and practical policy applications, a logical next step is the identification of hypotheses and alternative interventions that may reduce avoidable hospitalizations.

One of the relevant public policy questions is whether it is possible to identify factors in primary health care that play a role in avoiding hospitalizations for the selected ACSC conditions. Playing a role means applying one or more of the following interventions: primary prevention; early diagnoses (and treatment) of the condition or its precursor; good ongoing control and management.

The evolution of rates as a result of avoidable illnesses could help to advance the decision-making process regarding the configuration of primary-care networks and to indirectly monitor the health care effectiveness. High rates of hospitalization for certain conditions may indicate problems of access to primary health care and to qualified practitioners and inputs in difficult-to-access areas.

Moreover, the evolution of hospitalizations for certain conditions may provide evidence on the quality of health care protocols and the management of clinical practices as additional key elements of primary care. Consequently, these analyses may prove remarkably useful for establishing relevant research and public policy agendas aimed at improving the performance of health care systems in the region.

8. References

- Alfradique ME, Bonolo PF, Dourado I, et al. Ambulatory care sensitive hospitalizations: elaboration of Brazilian list as a tool for measuring health system performance. *Cad Saude Publica*. 2009; 25(6): p. 1337-49.
- Billings J, Zeitel L, Lukomnik J, Carey TS, Blank AE, Newman L. Impact of socioeconomic status on hospital use in New York City. *Health Aff*. 1993; 12(1); p. 162-73.
- Bodenheimer T, Wagner E, Grumbach K. Improving primary care for patients with chronic illness. *JAMA*. 2002 October; 288(15): p. 1909-1914.
- Caminal J, Casanova C. Primary care evaluation and hospitalization due to ambulatory care sensitive conditions. Conceptual framework. *Aten Primaria*. 2003.; 31(1); p. 61-5.
- Caminal J, Mundet X, Ponsa JA, Sanchez E, Casanova C. Las hospitalizaciones por ambulatory care sensitive conditions: selección del listado de códigos de diagnóstico válidos para España. *Aten Primaria*. 2003; 31(1): p. 6-14.
- Falik M, Needleman J, Wells BL, et al. Ambulatory care sensitive hospitalizations and emergency visits: experiences of Medicaid patients using federally qualified health centers. *Med Care*. 2001; 551(61).
- Fleischer NL, Diez Roux AV, Alazraqui M, Spinelli H, Lantz PM. Socioeconomic patterning in tobacco use in Argentina, 2005. *Nicotine Tob Res*. 2011 Oct; 13(10).
- Gill JM, Mainous AG. The role of provider continuity in preventing hospitalizations. *Archives of family medicine*. 1998;; p. 352-357.
- Glassman A, Gaziano T, Bouillon CP, Guanais FC. Confronting the chronic disease burden in Latin America and the Caribbean. *Health Aff*. 2010; 29(12); p. 2142-2148.
- Green W. *Econometric Analysis*. 5TH edition. Prentice Hall. Upper Saddle River, N.J, USA, 2003
- Guanais F, Macinko J. Primary care and avoidable hospitalizations: evidence from Brazil. *J Ambulatory Care Manage*. 2009; 32(2): p. 115-22.
- Jones DJ, Crump AD, Lloyd JJ. Health Disparities in Boys and Men of Color. *Am J Public Health*. 2012;([Epub ahead of print]).
- Lavoie JG, Forget EL, Dahl M. et al. Is it worthwhile to invest in home care? *Healthcare Policy*. 2011;(35-48).
- Macinko J, de Oliveira VB, Turci M, Guanais FC, Bonolo PF, Lima-Costa MF. The influence of primary care and hospital supply on ambulatory care-sensitive hospitalizations among adults in Brazil, 1999-2007. *Am. J. Public Health*. 2011; 101(10).

- Macinko J, Dourado I, Aquino R, Bonolo PdF, Lima-Costa MF, Medina MG, et al. Major expansion of primary care in Brazil linked to decline in unnecessary hospitalization. *Health Aff.* 2010; 29(12).
- Macinko J, Dourado I, Guanais F. Chronic Diseases, Primary Care and Health Systems Performance Diagnostics, Tools and Interventions. Discussion Paper. 2011 November.
- Mendonca CS, Harzheim E, Duncan BB, et al. Trends in hospitalizations for primary care sensitive conditions following the implementation of Family Health Teams in Belo Horizonte, Brazil. *Health Policy Plan.* 2011;(043).
- Panamerican Health Organization. Health in the Americas 2007. Scientific and Technical Publication; 2007. Report No. 622.
- Panamerican Health Organization. Plan of Action for Cancer Prevention & Control 2008-2015. ; 2008.
- Raban MZ, Dandona R, Kumar GA, Dandona L. Inequitable coverage of non-communicable diseases and injury interventions in India. *Natl Med J India.* 2010 Sep-Oct; 23 (5).
- Wagner EH, Austin BT, Davis C, Hindmarsh M, Shaefer J, Bonomy A. Improving chronic illness care: translating evidence into action. *Health Aff.* 2001; 20(6): p. 64-78.
- Weinberger M, Oddone E Z, Henderson WG. Does increased access to primary care reduce hospital readmissions? Veterans Affairs Cooperative Study Group on Primary Care and Hospital Readmission. *N Engl J Med.* 1996; 10: p. 1441-7.
- Weissman JS, Gatsonis C, Epstein AM. Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *JAMA.* 1992.
- World Health Organization. The world health report 2008 : primary health care now more than ever. Geneva: World Health Organization; 2008.