Quality of ambulatory care in the Spanish National Health System

Analysis of three OECD indicators and some alternatives

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Recognition

This report is part of the series of studies included in the Variations in Medical Practice and Quality of Health Care Project developed by the Atlas VPM Group*. Data is transferred from the Regional Health Authorities involved in Atlas VPM Group*. (For more details you can consult the web http://www.atlasvpm.org).

Conflicts of interest and disclaimers

Most of the members of the Atlas VPM Group* are working for the Regional Health Services or Health Institutions of the country. The aforementioned Institutions do not necessarily share the contents of this report, which is entirely the responsibility of their authors

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Quality of ambulatory care in the Spanish National Health System

Analysis of three OECD indicators and some alternatives

This study has been conducted by Aragones Institute of Health Sciences through a contract with the Spanish Ministry of Health and Consumer Affairs.

Contents

1. Context of this brief report

This document includes the analysis and results of two working papers carried out during 2007 and 2008 by the Health Services Research unit of the Institute for Health Sciences in Aragon. A National Grant to validate AHRQ Preventable Quality Indicators (PQI) for the Spanish case is being carried out during 2009 and 2010 (PI08/90255 Institute for Health Carlos III).

2. Background

Hospitalizations might be considered a negative result of healthcare under the assumption that ambulatory care –not only primary care-, is effective to prevent them.

Several efforts have been made along two decades, to determine which hospitalizations could be considered avoidable. Ambulatory Care Sensitive Conditions (ACSC) became the most popular example of these initiatives.

However, the construct validity is often subject of criticism since high rates of ACSC might flag at the same time, ambulatory care underserved areas, primary care underserved areas, lack of effectiveness in ambulatory (or primary) care, but also high rates of poverty, high rates of low educational levels, aged areas, rural areas, bed supply, rates of uninsured people, etc.

In the particular case of hospitalizations for chronic conditions (COPD, Diabetes, HTA, etc) high rates might flag an area as a “bad apple” when exposure of population to underperforming care occurred along decades.

Finally, rates of preventable hospitalizations have a different meaning regarding the Healthcare System. Rates in a universal compulsory system based on primary care practitioners acting as gatekeepers, within integrated providers, will mean a different thing to that in a private insurance hospital focused system with multiple fragmented insurers and providers.

In spite of these limitations or threats, preventable quality indicators are being suggested either to assess access or effectiveness in Primary (or Ambulatory) Care. The caveats about their construct validity and the deep differences in the meaning of rates with regard to the characteristics of the Healthcare System, recommend local validation. OECD has suggested three "PQI" which look at these kind of ideas: HTA, Adult Asthma and Uncontrolled Diabetes Admissions

3. Objective

To assess the construct and the empirical validity on HTA, Adult Asthma and Uncontrolled Diabetes hospitalizations as defined by OECD.

4. Methods

Perspective: For the Spanish National System the relevant perspective for the analysis of Preventable Hospitalizations is the geographical one. Population is administratively distributed in geographic healthcare areas (with very small flows of people from one area to another), and 100% of the population is attended by Primary Care physicians who act as gatekeepers. Thus, rates of avoidable hospitalizations are estimated using as denominator the population who lived in the area rather than the persons who were attended.

Design and setting: Observational, ecological study on hospital admissions produced in 142 healthcare areas in 2003 and 2004. There was also an analytical component looking at factors related with variation among healthcare areas.

Main endpoint: Standardized rates of admissions by a specific condition per 10,000 inhabitants living in a specific healthcare area (i.e. people at risk of suffering an avoidable admission).

Variables: Conditions and their definitions (ICD_MC 9th codes) are shown in Box 1.

Box 1 OECD PQIs and their ICD definitions

Asthma
49300, 49321, 49301, 49322, 49302, 49381, 49310, 49382, 49311, 49390, 49312, 49391, 49320, 49392.
Uncontrolled Diabetes
With complications: 25012, 25022, 25032, 25042, 25052, 25062, 25072, 25082, 25092, 25013, 25023, 25033, 25043, 25053, 25063, 25073, 25083, 25093. Without complications: 25002, 25003
Hypertension
4010, 40310, 4019, 40390, 40200, 40400, 40210, 40410, 40290, 40490, 40300.

Factors analysed: Demand factors (like age, sex and social gradient) and supply factors (like number of beds available in the area, or number of primary care physicians working in the area, emergency room workforce in the area, etc.) were explored as potential related factors.

5. Analysis

Construct validity

In order to identify potential threats to the construct validity, codes used to define OECD indicators were compared with definitions agreed by the "Technical Unit for ICD-MC coding issues in the Spanish National Health Service [SNHS]" (technical document by this unit are available at:

http://www.msc.es/estadEstudios/estadisticas/normalizacion/clasifEnferm/boletines/home.htm)

Magnitude of the event

In order to determine the magnitude of avoidable admissions, crude (total, by sex, older than 60) and age-sex standardized rates were estimated for each condition (direct method of standardization).

Magnitude of systematic variation

As in Small Area Analysis, in order to determine variability among healthcare areas, extremal quotient (ratio between the highest and the lowest rate), the systematic component of variation (ratio between the observed and the expected cases, estimating the expected by using the indirect method of standardization, understood as the proportion of cases observed over those expected by chance) and the standardized utilization ratio (indirect method, equivalent to a Standardized Mortality Ratio in epidemiology).

Rates of avoidable hospitalizations and related factors

To determine the relationship between rates and supply or demand factors, and in order to become more intuitive, every single factor was divided into tertiles. Standardized rates were estimated by tertile, and Oneway ANOVA and Bonferroni tests were applied to determine statistically significant differences.

6. Results

1. Adult Asthma Avoidable Hospitalizations

Variability and sensitivity of the indicator

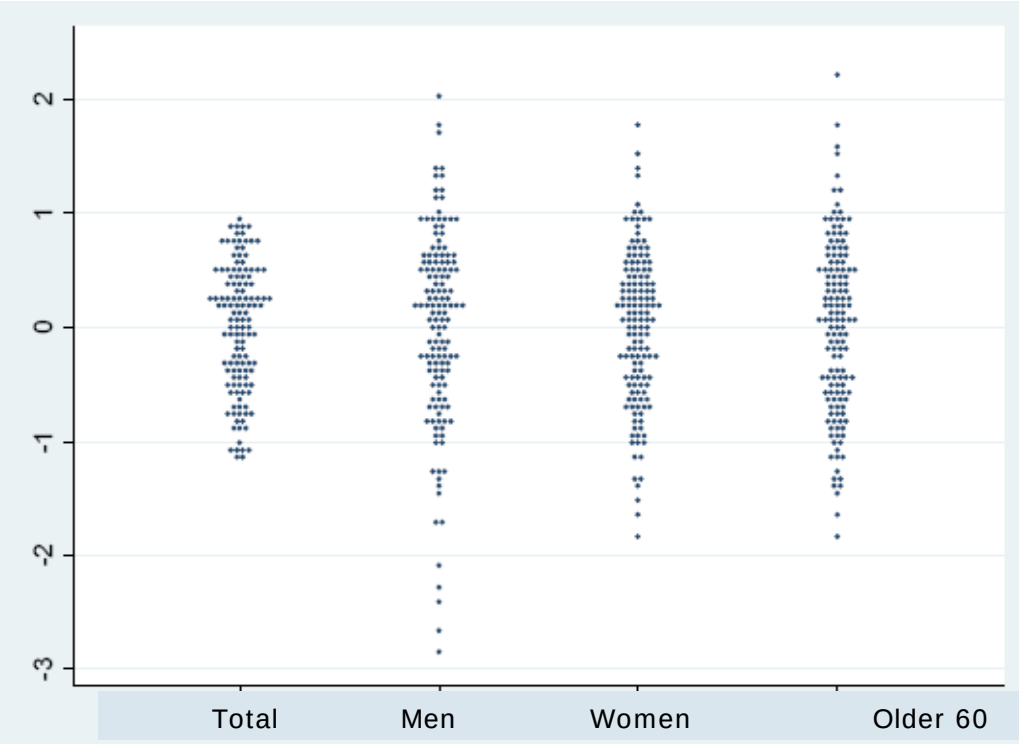
27,369 admissions were produced during the period of study which represented a crude rate of 5.86 admissions per 10,000 inhabitants. Dramatic variation was found among areas (EQ=6.3)) particularly when patients older than 60 and men were analysed (EQ=7.2 and 9.5, respectively). Systematic Variation, variation beyond chance, was high: SCV ranged from 27% -when all patients where studied- to 38% -in the case of admissions in men-. Women are more likely to be admitted although variation among areas is smaller than in men. Table 1 and Exhibit 1 show these figures in a more detailed way.

Table 1. Statistics for Adult Asthma Avoidable Hospitalizations

	Total	Older than 60	Men	Women
Magnitude of event				
Cases	27,369	17,294	6,875	20,494
Crude rate	5.86	9.15	2.95	8,81
Standardized rate	5.16	9.56	2.74	7.39
Standardized rate P5	1.47	2.91	0.61	2.55
Standardized rate P25	2.87	4.61	1.44	4.11
Standardized rate P50	4.89	8.59	2.74	6.92
Standardized rate P75	7.07	13.25	3.77	9.75
Standardized rate P95	9.95	20.97	5.82	14.40
Variation statistics				
EQ5-95	6.30	7.20	9.54	5.65
EQ25-75	2.46	2.87	2.62	2.37
wCV5-95	0.48	0.56	0.60	0.46
SCV5-95	0.27	0.37	0.38	0.26

* Rates are calculated per 10,000 inh. EQ Extremal Quotient wCV weighted coefficient of variation SCV: Systematic Component of Variation. P# represents the standardized rate of the areas include in the # percentile; 5-95 represents the estimation for the areas between the 5 and 95 percentiles; 25-75 represents the estimation for the areas between the 25 and 75 percentiles.

Exhibit 1 Variation in standardized rates of avoidable hospitalizations
Adult Asthma



Each dot represents a healthcare area. Y axis represents log-standardized rates centred in the mean (mean=0)

Finally, in terms of the sensitivity of the indicator, it must be said that 48 healthcare areas have Adult Asthma admissions over the expected (statistically significant difference) which represent the 33.8% of the sample.

Threats to construct validity

Definition suggested by OECD includes acute and chronic conditions. Therefore, an ambulatory care provider can be incorrectly classified as a “bad performer” because of the inadequate treatment in the past.

In the case of Asthma, acute conditions, like asthmatic status, could better represent the construct of this indicator. Unfortunately, following the Spanish agreement for coding Asthma, asthmatic status (identified in the fifth digit) may represent at the same time drug resistance or severe asthmatic crisis or untreatable asthma. The heterogeneity of conditions and patients under the same definition limits considerably its use to measure quality in primary care

On the other hand, the indicator is quite sensitive to supply. So acute-care beds per 1,000 inhabitants or long-term care beds per 1,000 inhabitants are related with rates of hospitalizations. Finally, social gradient is also related with rates of admission by Asthma. People who live in areas with more incomes are more likely to be admitted.

Recommendation

In summary: although the dramatic variability and the high sensitivity to detect areas over the expected would justify the use of this indicator, major construct validity problems –basically derived from the way Asthma is defined by using ICD-MC codes- and the effect of bed supply on rates, limits its use to measure quality of ambulatory care.

2. Uncontrolled Diabetes Avoidable Hospitalizations

Variability and sensitivity of the indicator

2,823 admissions were considered in this study, which implies a crude rate of 0.66 admissions per 10,000 inh. Systematic Variation, variation beyond chance, reached 90% for all admissions. When patients older than 60 where observed, systematic variation reached 117%. Admissions in men were more variable than admission in women (99% vs 71%). Table 2 and Exhibit 2 show more detailed figures.

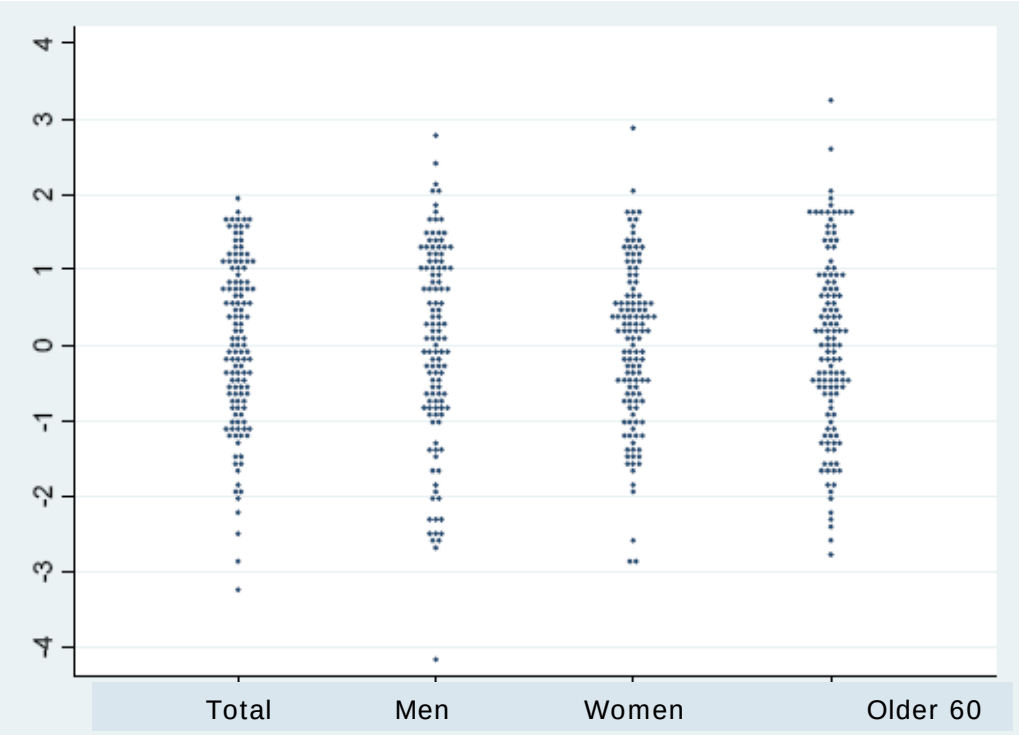
Table 2. Statistics for Uncontrolled Diabetes Avoidable Hospitalizations

	Total	Older than 60	Men	Women
Magnitude of event				
Cases	2,823	1,617	1,320	1,503
Crude rate	0.66	0.97	0.64	0.68
Standardized rate	0.51	0.81	0.51	0.48
Standardized rate P5				
Standardized rate P25	0.11	0.13	0.04	0.10
Standardized rate P50	0.29	0.43	0.27	0.33
Standardized rate P75	0.75	1.09	0.87	0.67
Standardized rate P95	1.70	3.19	1.70	1.56
Variation statistics				
EQ5-95				
EQ25-75	6.62	8.27	22.52	6.41
wCV5-95	0.99	1.17	1.06	0.95
SCV5-95	0.90	1.24	0.99	0.71

* Rates are calculated per 10,000 inh. EQ Extremal Quotient wCV weighted coefficient of variation SCV: Systematic Component of Variation. P# represents the standardized rate of the areas include in the # percentile; 5-95 represents the estimation for the areas between the 5 and 95 percentiles; 25-75 represents the estimation for the areas between the 25 and 75 percentiles.

With regard to the sensitivity of the indicator, 23% of the healthcare areas were over the expected (statistically significant differences).

Exhibit 2 Variation in standardized rates of avoidable hospitalizations
Uncontrolled Diabetes



Each dot represents a healthcare area. Y axis represents log-standardized rates centred in the mean (mean=0)

Threats to construct validity

Conditions considered in this indicator are defined by a fifth digit. Even though this fifth digit is well coded, the definition of this digit is unable to meet the construct of this indicator. In fact, following the above-mentioned technical agreement for coding in the SNHS, "… these digits should be used when uncontrolled diabetes or diabetes with difficult control is reported even though the treatment is correct …". So we could classify as avoidable hospitalizations non-avoidable hospitalizations.

On the other hand, the indicator is sensitive to the supply of acute-care beds (the more the beds the more the rate of hospitalizations) and social gradient (the more the income the more the admissions).

Recommendations

It is not adequate to use this indicator to measure avoidable hospitalizations. Alternatively, we suggest an indicator including acute or short-term complications of diabetes (coma and amputation with gangrene). A pilot validation for Spain shows (see final considerations) that using this suggestion the construct validity improves, systematic variation remains (SCV=0.59) and sensitivity lingers high (37% of healthcare area are statistically over the expected).

3. Hypertension Avoidable Hospitalizations

Variability and sensitivity of the indicator

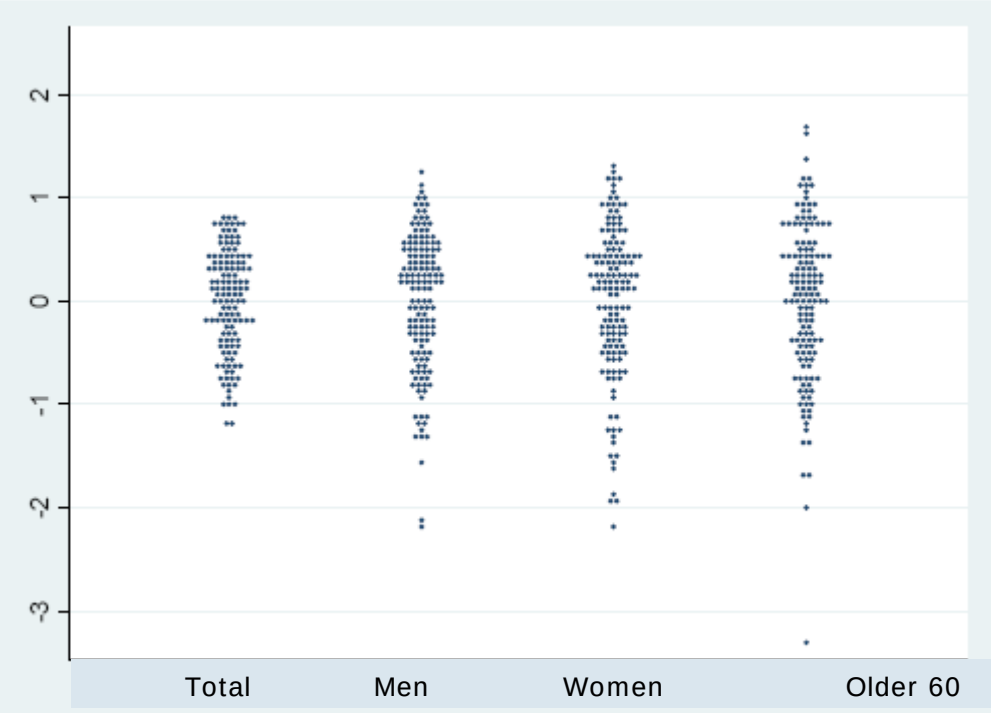
7.140 cases were studied which represented a crude rate of 1.52 per 10,000 inh. EQ showed 5 fold differences among extreme areas, and systematic variation was 21%, reaching 28% when hospitalizations in women were analysed and 29% when patients older than 60 were considered. Table 3 and Exhibit 3 show these figures in a more detailed way.

Table 3. Statistics for Hypertension Avoidable Hospitalizations

	Total	Older than 60	Men	Women
Magnitude of event				
Cases	7,140	4,772	3,142	3,998
Crude rate	1.52	2.47	1.33	1.70
Standardized rate	1.34	2.72	1.24	1.41
Standardized rate P5	0.49	0.82	0.41	0.34
Standardized rate P25	0.82	1.49	0.74	0.80
Standardized rate P50	1.26	2.43	1.27	1.36
Standardized rate P75	1.78	3.55	1.70	1.83
Standardized rate P95	2.50	5.73	2.31	2.92
Variation statistics				
EQ5-95	5.03	7	5.59	8.58
EQ25-75	2.17	2.39	2.30	2.29
wCV5-95	0.43	0.51	0.46	0.50
SCV5-95	0.21	0.29	0.18	0.25

* Rates are calculated per 10,000 inh. EQ Extremal Quotient wCV weighted coefficient of variation SCV: Systematic Component of Variation. P# represents the standardized rate of the areas include in the # percentile; 5-95 represents the estimation for the areas between the 5 and 95 percentiles; 25-75 represents the estimation for the areas between the 25 and 75 percentiles.

Exhibit 3 Variation in standardized rates of avoidable hospitalizations
Hypertension



Each dot represents a healthcare area. Y axis represents log-standardized rates centred in the mean (mean=0)

In terms of sensitivity, 37 (26.6%) healthcare areas had admissions statistically over the expected.

Threats to construct validity

Several coding issues might affect construct validity. First, the definition is very heterogeneous to attribute properly good or bad performance; it includes malign conditions, benign conditions and conditions not classified either as malign or benign. On the other hand, non-specific digits (using 9 as 4th digit) represent 100% of the discharges.

Second, acute situations, like congestive heart failure, closer to the construct, are specifically excluded.

Finally, the indicator is directly correlated with the supply of acute-care beds.

Recommendations

Although the indicator has some empirical properties, its lack of consistency with the construct of this kind of indicators requires alternative measures, for example, Congestive Heart Failure admissions.

In the pilot study, this indicator showed low systematic variation (SCV=0.09), although it kept high sensitivity (35% of areas were statistically over the expected). Its use would require standardization by age, sex and social gradient. It is not sensitive to supply factors.

7. Final considerations

In general, construct validity, particularly the way coding issues meet the rational underlying avoidable hospitalizations, fails in those three OECD indicators. Additionally, they are affected by hospital factors (acute-beds supply, for example) blurring the objective to flag ambulatory-care performance.

Some lessons from Spain

A new set of Avoidable Hospitalizations is being empirically proved for the Spanish Box 2 shows them and its ICD-MC 9th definitions.

Box 2 Some PQI for the Spanish case and their ICS definitions

Diabetes Mellitus acute complications (a-Diab)
251.0
250.1
250.2
250.3
250.7 with 785.4
Congestive Heart Failure (CHF)
402.01
402.11
402.91
428.0
428.1
COPD reagudization (COPD-r)
491.21
Haemorrhagic complications in ulcus (H-Ulc)
531.00, 531.20, 531.40, 531.60
532.00, 532.20, 532.40, 532.60
533.00, 533.20, 533.40, 533.60
534.00, 534.20, 534.40, 534.60
Appendectomy in a Complicated Appendicitis (c-Appen)
540.0
540.1
Acute High Tract Urinary Infection (a-HTUI)
590.10

Main results from our pilot study showed: Systematic Variation in all of them (see table 4, and exhibit 4 and 5), sensitivity for detecting areas below and above the expected (see maps, exhibit 6) and are not affected by hospital beds supply. In general, they need social gradient adjustment.

With regard to the analytical methodology, and given the objective of PQI and the aforementioned characteristics of the SNHS, the pilot suggests that a complementary, or better, option for the analysis of PQI in Spain, would be to analyse the effect of the two levels of attention which share the same territory: Basic Zones for Healthcare which provide Primary Care and Healthcare Areas which include Basic Zones and also provide Hospital Care. (A healthcare area is composed by several Basic Zones).

Using this analytical method we get additional information; thus, the more the variance explained by the Healthcare Area (second level), the less the adequacy to attribute a bad performance to the ambulatory care. Additionally, given the small numbers expected in Basic Zone of Healthcare, Bayesian techniques will be needed to estimate rates.

Rates of hospitalizations and statistics of variation in 142 healthcare areas (2003 y 2004)

	H-Ulc	c-Appen	CHF	a-HTUI	COPD-r	a-Diab
Magnitude of the event						
Cases	17,833	9,739	114,847	20,471	10,632	1,397
Crude rate	3.06	1.74	19.54	3.37	1'95	0.28
Standardized rate	2.97	1.75	18.7	3.41	1.79	0.27
Standardized rate P5	1.66	0.82	8.7	1.05	0.27	0
Standardized rate 25	2.32	1.23	13.6	1.79	0.73	0.08
Standardized rate P50	2.9	1.55	18.13	2.67	1.5	0.18
Standardized rate P75	3.6	1.96	23.34	4.52	2.58	0.36
Standardized rate P95	4.6	3.04	29.71	8.26	4.28	0.88
Statistics of variation						
EQ $_{5-95}$	2.77	3.7	3.41	7.86	15.85	
EQ $_{25-75}$	1.55	1.59	1.71	2.52	3.53	4.5
wCV$_{5-95}$	0.26	0.31	0.28	0.55	0.62	0.95
SCV $_{5-95}$	0.05	0.07	0.09	0.29	0.34	0.59

* Rates are calculated per 10,000 inh. EQ Extremal Quotient wCV weighted coefficient of variation SCV: Systematic Component of Variation. P# represents the standardized rate of the areas include in the # percentile; 5-95 represents the estimation for the areas between the 5 and 95 percentiles; 25-75 represents the estimation for the areas between the 25 and 75 percentiles.

Exhibit 4

Variation in standardized rates of avoidable hospitalizations

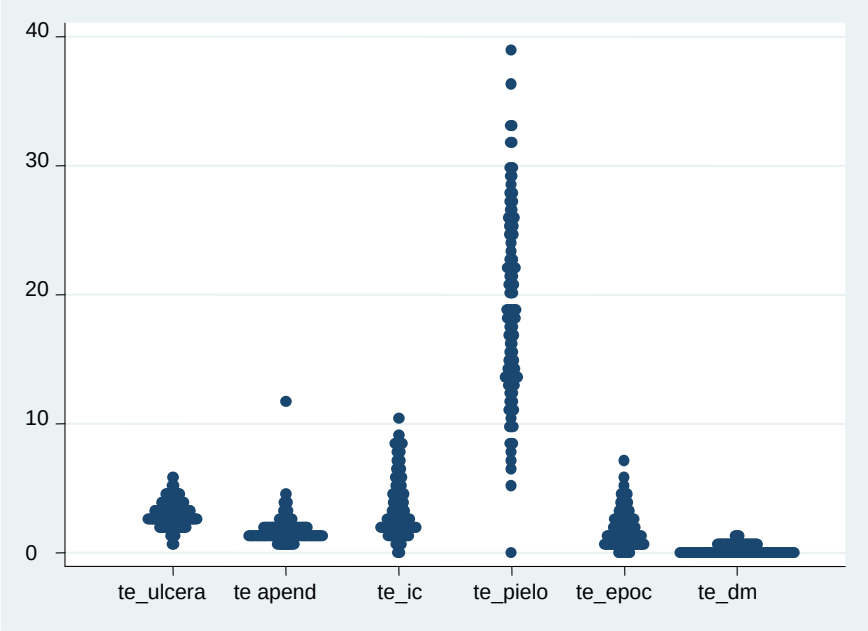
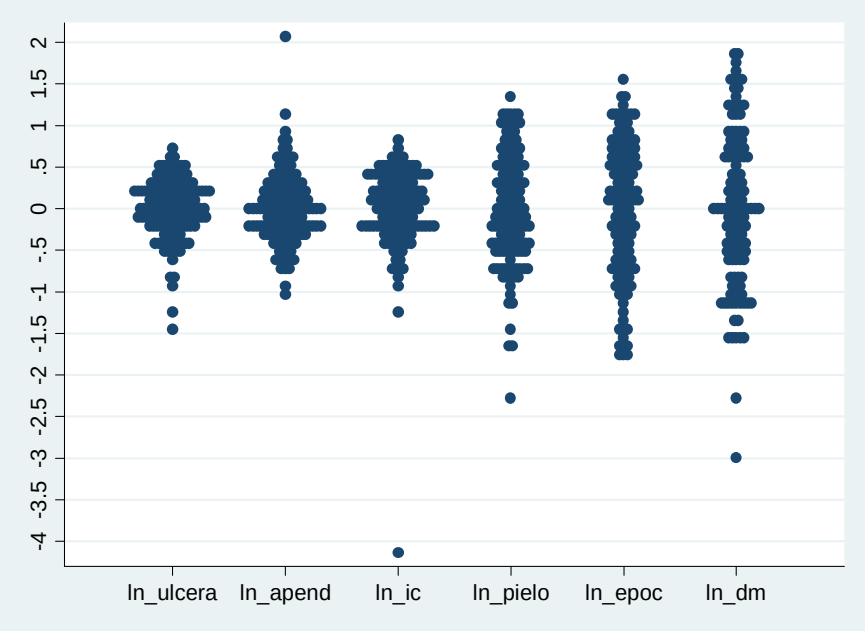


Exhibit 5

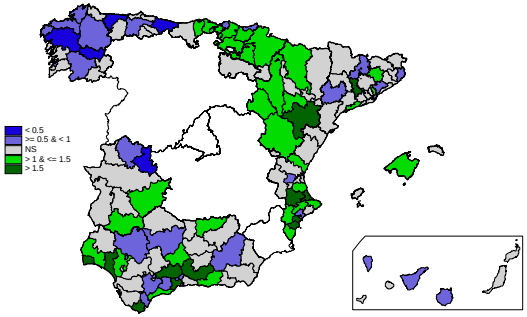
Variation in standardized rates of avoidable hospitalizations



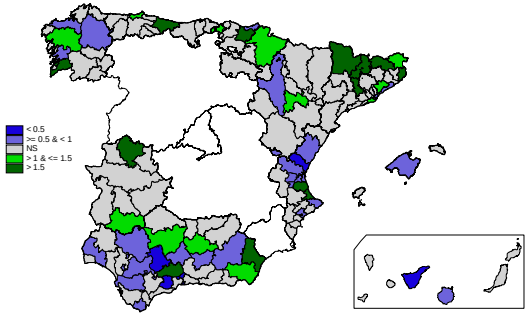
Each dot represents a healthcare area. Y axis Exhibit 5 represents log-standardized rates centred in the mean (mean=0)

Exhibit 6 Standardized Utilization Ratio

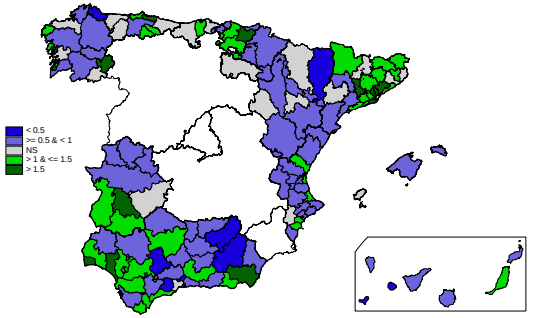
Haemorrhagic complications in ulcus (H-Ulc)



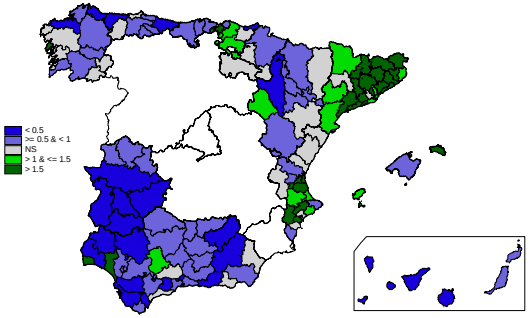
Appendectomy in a Complicated Appendicitis (c-Appen)



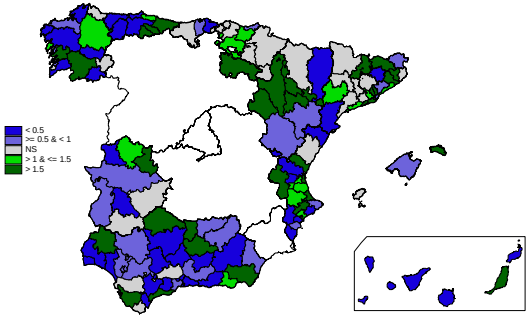
Congestive Heart Failure (CHF)



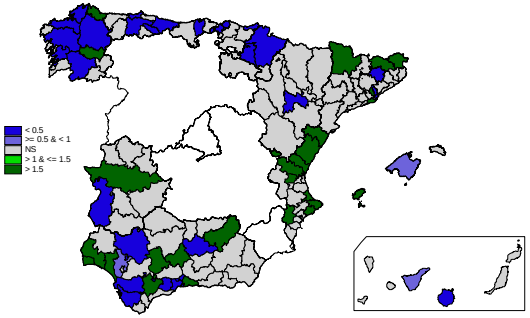
Acute High Tract Urinary Infection (a-HTUI)



COPD reagudization (COPD-r)



Diabetes Mellitus acute complications (a-Diab)



Ratio between the observed and the expected (indirect method of standardization). Green represents those areas with more cases than expected. Blue areas represent those areas with lesser cases than the expected. Grey areas represent areas above or below the null but the difference is not statistically significant. Blank areas represent no data in the years of study

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