Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

hpsc

# CONSUMPTION OF ANTIBIOTICS IN PUBLIC ACUTE HOSPITALS IN IRELAND
# DATA TO END OF 2012

**MAIN POINTS**

- **There was a 5% rise in the median usage rate from 83.1 Defined Daily Doses per 100 Bed-Days Used (DDD/100BDU) for 2011 to 87.0 DDD/100BDU for 2012**
- **The median antibiotic consumption rate increased greatly among specialist hospitals but remained relatively stable among general and regional/tertiary hospitals**
- **There was a 48% increase in sulphonamides/trimethoprim consumption in 2012 as a whole, though the increase was mainly in the last quarter**
- **For Q4 of 2012 consumption of macrolides, penicillins with beta-lactamase inhibitors (such as co-amoxiclav) and other antimicrobials increased in line with seasonal trends**
- **The proportion of a specific set of antibiotics in injectable form (those that could be easily switched to oral form) remained unchanged at 7.0%**

As part of the HSE strategy for prevention and control of healthcare-associated infection, launched in March 2007, the Health Protection Surveillance Centre (HPSC) was asked to coordinate the publication of data relating to antimicrobial consumption for acute public hospitals in Ireland. The first report was produced in 2007 providing the initial baseline publication of these data.

The primary value of this dataset is to the individual data providers, allowing individual hospitals to monitor trends over time, assess the impact of antibiotic stewardship programmes, and identify targets for future interventions and resource requirements. The data included in this report do not allow direct comparison of results between individual hospitals.

## CONTENTS

## SECTION A. METHODS AND LIMITATIONS

Using a protocol developed in conjunction with clinical pharmacists, quarterly antimicrobial data were extracted from appropriate hospital computer systems that record data on dispensed drugs. At the HPSC, the data from individual hospitals were converted to standardised units of doses. Only consumption relating to inpatients were taken further for rate calculation.

In this report the Anatomical Therapeutic Chemical (ATC) index (www.whocc.no/atcddd) is used to classify all drugs used in human medicine into a hierarchical system with five levels. Each systemic antimicrobial substance in conjunction with the route of administration (oral or intravenous) is given a defined daily dose (DDD), which is the assumed average maintenance dose per day for a drug used for its main indication in adults.

The main limitation for the ATC-DDD system is that the quantities refer to the usual dose that would be prescribed for adults. There are many hospitals in the sample that provide maternity services and/or paediatric care, therefore there is an inherent bias in the system. A further limitation with the ATC-DDD system is that the measure is for the main indication only, but a single drug can be used to treat several different conditions. Additionally the rates for an individual hospital may vary due to changes in case-mix, guidelines for the optimal dosage regimen of an antibiotic, and overall hospital activity levels.

The consumption data are based on the volume of antimicrobial drugs supplied to inpatient areas by hospital pharmacies. The data are not based on individual prescriptions and do not measure the appropriateness of antimicrobial therapy. Thus a hospital may report a high rate of antimicrobial consumption, but this rate may be appropriate to the specific patient population served by that hospital.

At the end of 2012, it became necessary to transfer Irish hospital antimicrobial consumption data from MS Access to MS SQL Server in order to manage the very large dataset. The analytical methods were also improved and this has resulted in changes in the outputs. *Therefore please note that figures for previous years have been updated and may vary from previously published data.* The dataset has also been web-enabled and designated pharmacists in Ireland are now able to review their own hospital's data in detail online.

### Measures presented in Table 1

1. Total acute inpatient antibiotic consumption in Defined Daily Doses per 100 Bed-Days Used (DDD/100BDU) for each hospital is presented. Acute inpatient means that data on antibiotics dispensed to outpatients, day cases and external facilities are excluded. The denominator data were obtained from the Business Intelligence Unit of the Corporate Planning and Corporate Performance (CPCP) section of the HSE

2. The following antimicrobial agents have good oral bioavailability and therefore, for many patients, it may be possible to switch from intravenous (IV) to oral use or initiate treatment orally: *ciprofloxacin, clarithromycin, clindamycin, erythromycin, fusidic acid, levofloxacin, linezolid, metronidazole, moxifloxacin* and *rifampicin*. In Table 1, the proportion of the volume used in DDD of these specific agents in IV form over total antibiotic use in DDD is expressed as percentage for each hospital

## SECTION B. TOTAL CONSUMPTION BY INDIVIDUAL HOSPITAL (MAIN TABLE)

Table 1. Antibiotic consumption data for 41 public acute hospitals for 2012 are presented with updated figures for 42 hospitals for 2011. See methods for details of the measures

| Acute Public Hospital | Acute Inpatient Antibiotic Consumption Rate (DDD per 100 bed-days used) | | Proportion of Specific IV antibiotics | |
|---|---|---|---|---|
| | 2011 | 2012 | 2011 | 2012 |
| Bantry General Hospital | * | * | * | * |
| Beaumont Hospital | 77.6 | 101.6 | 6.4% | 7.1% |
| Cappagh National Orthopaedic Hospital, Dublin | 53.8 | 67.0 | 0.7% | 0.5% |
| Cavan General Hospital | 91.3 | 90.1 | 4.9% | 5.9% |
| Children's University Hospital, Temple Street | 82.4 | 99.4 | 8.4% | 7.9% |
| Connolly Hospital, Blanchardstown [1] | 71.7 | 79.7 | 6.5% | 7.0% |
| Coombe Women's Hospital | 28.9 | 33.7 | 6.4% | 6.5% |
| Cork University Hospital | 75.4 | 73.1 | 6.8% | 6.5% |
| Galway University Hospitals | 99.8 | 87.1 | 6.5% | 7.2% |
| Kerry General Hospital, Tralee | 71.1 | 77.2 | 7.8% | 8.3% |
| Letterkenny General Hospital | 94.0 | 100.6 | 8.3% | 8.7% |
| Lourdes Orthopaedic Hospital, Kilcreene, Kilkenny | 26.7 | 56.8 | 0.8% | 1.5% |
| Louth County Hospital, Dundalk [2] | NA | NA | NA | NA |
| Mallow General Hospital | 95.2 | 109.5 | 13.6% | 12.2% |
| Mater Misericordiae University Hospital | 82.9 | 83.9 | 9.1% | 9.2% |
| Mayo General Hospital, Castlebar | 92.7 | 89.1 | 10.7% | 10.6% |
| Mercy University Hospital, Cork | 92.7 | 102.0 | 12.0% | 8.9% |
| Midland Regional Hospital Mullingar | 86.5 | * | 13.0% | * |
| Midland Regional Hospital Portlaoise | * | * | * | * |
| Midland Regional Hospital Tullamore | 103.0 | 111.6 | 6.1% | 4.6% |
| Mid-Western Regional Hospital Ennis | 90.0 | 92.8 | 1.9% | 3.4% |
| Mid-Western Regional Hospital Nenagh | 81.4 | 88.1 | 1.9% | 2.1% |
| Mid-Western Regional Hospital, Dooradoyle, Limerick [4] | 81.0 | 84.4 | 9.8% | 9.1% |
| Naas General Hospital | 97.1 | 96.0 | 8.6% | 9.2% |
| National Maternity Hospital, Holles Street [5] | 22.7 | 29.6 | 7.3% | 8.5% |
| Our Lady of Lourdes Hospital, Drogheda | 97.8 | 100.4 | 7.8% | 9.6% |
| Our Lady's Hospital for Sick Children, Crumlin | 74.6 | 70.3 | 5.3% | 4.6% |
| Our Lady's Hospital, Navan | 110.7 | 120.3 | 4.4% | 3.8% |
| Portiuncula Hospital, Ballinasloe | 83.2 | 87.0 | 8.3% | 6.3% |
| Roscommon County Hospital | 105.3 | 92.2 | 3.7% | 1.1% |
| Rotunda Hospital [6] | 29.0 | 27.9 | 7.2% | 12.1% |
| Royal Victoria Eye & Ear Hospital, Dublin | 46.2 | 56.8 | 12.2% | 12.4% |
| Sligo General Hospital | 67.0 | 67.1 | 7.3% | 6.3% |
| South Infirmary - Victoria University Hospital, Cork | 73.2 | 67.2 | 13.8% | 10.3% |
| South Tipperary General Hospital, Clonmel | 86.3 | 106.8 | 5.0% | 5.3% |
| St Columcille's Hospital, Loughlinstown | 93.4 | 85.3 | 8.9% | 10.6% |
| St James's Hospital | 81.3 | 81.4 | 9.3% | 10.0% |
| St John's Hospital, Limerick | 94.2 | 102.1 | 3.7% | 3.5% |
| St Luke's General Hospital, Kilkenny | 79.2 | 75.9 | 4.7% | 3.5% |
| St Luke's Hospital, Dublin | 25.7 | 30.7 | 4.7% | 6.0% |
| St Michael's Hospital, Dun Laoghaire | 93.3 | 96.6 | 6.7% | 6.7% |
| St Vincent's University Hospital | 135.6 | 126.7 | 7.3% | 8.1% |
| Tallaght Hospital | 91.8 | 88.6 | 10.1% | 11.3% |
| Waterford Regional Hospital | 90.6 | 83.4 | 5.4% | 5.0% |
| Wexford General Hospital | 78.2 | 86.0 | 5.1% | 5.4% |

[1] Denominator data for Q2 & Q3 of 2012 under review

[2] Acute activity too low for reporting since 2011

[3] Data represents Q1, Q2 & Q3 of 2012 only

[4] Includes Mid-Western Regional Maternity Hospital and Croom Orthopaedic Hospital

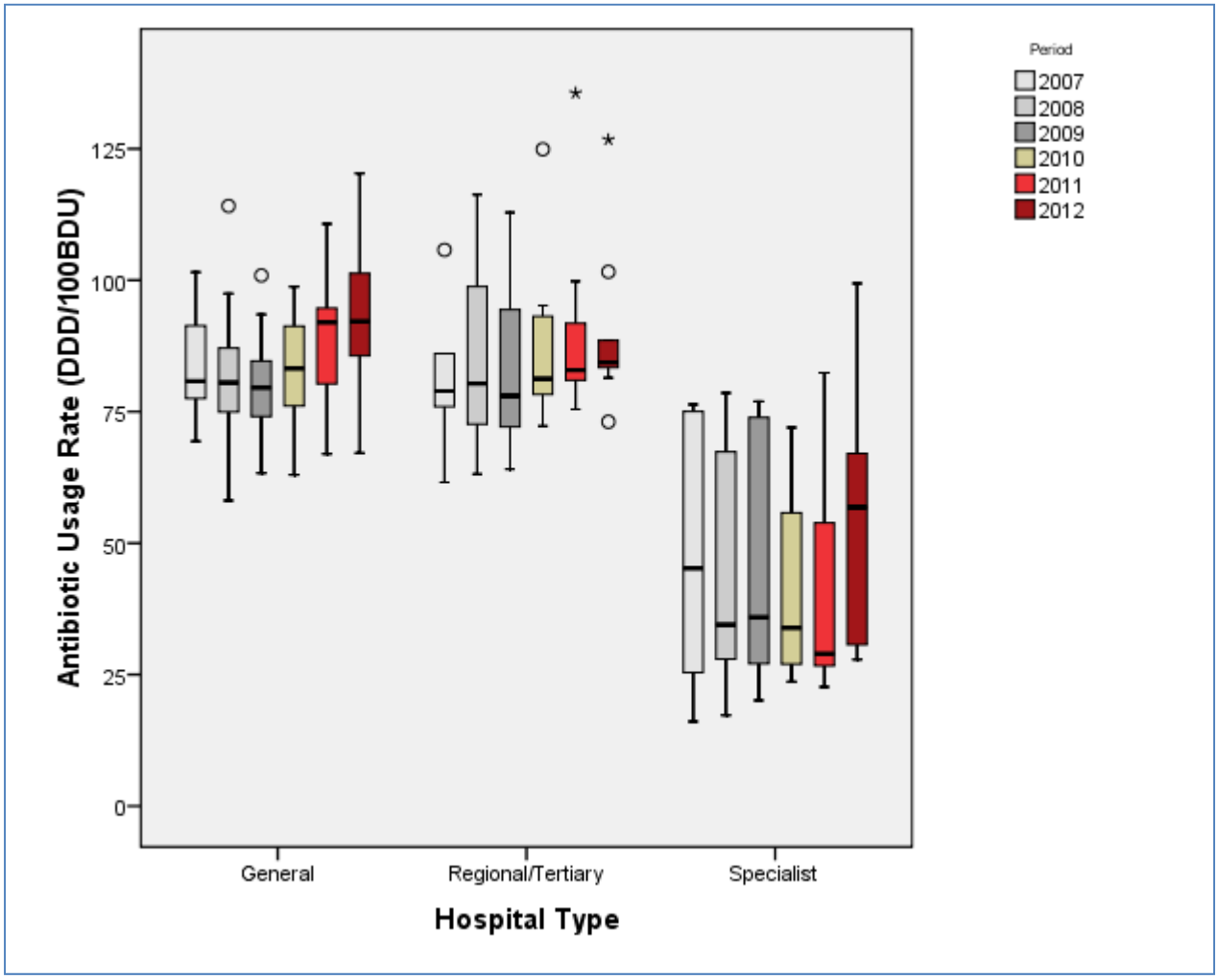
[5] Data represents Q1 & Q2 of 2012 only

[6] New rporting system, data under review

[NA] Not applicable

* Data not available

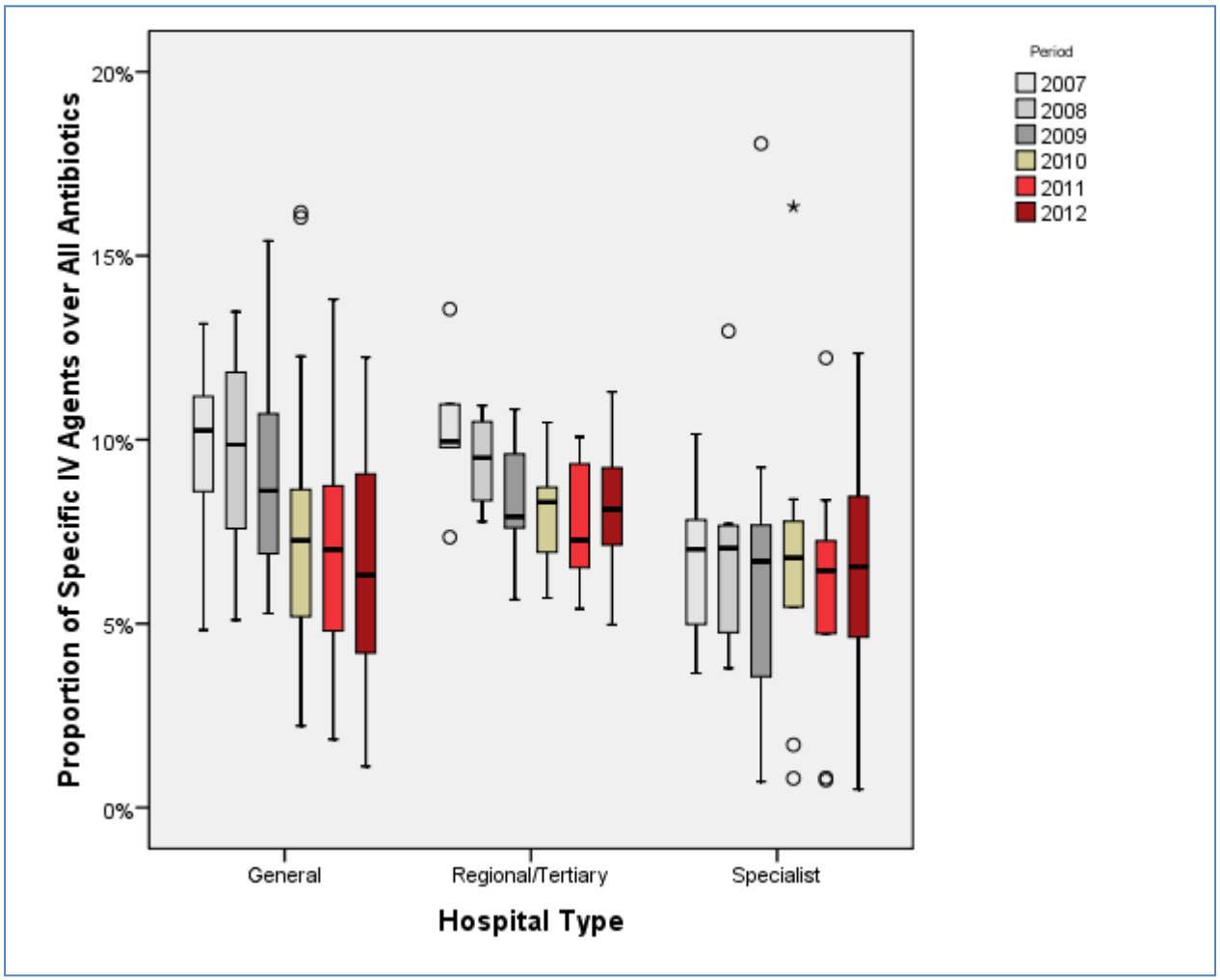
## SECTION C. BREAKDOWN BY HOSPITAL CATEGORY




Graph 1. Box plot of antibiotic consumption in DDD per 100 BDU for public acute hospitals by hospital category, from 2007 to 2012. See page 5 for an explanation of the plot

Table 2. Median antibiotic consumption rate in DDD per 100 BDU for public acute hospitals by hospital category and the number of hospitals (n), from 2007 to 2012

| | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hospital Category** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** |
| General | 80.8 | 21 | 80.5 | 25 | 79.6 | 26 | 83.2 | 25 | 92.0 | 24 | 92.2 | 23 |
| Regional/Tertiary | 78.9 | 5 | 80.4 | 8 | 78.0 | 9 | 81.2 | 9 | 82.9 | 9 | 84.4 | 9 |
| Specialist | 45.2 | 8 | 34.5 | 9 | 35.9 | 9 | 33.9 | 9 | 29.0 | 9 | 56.8 | 9 |
| **All Hospitals** | **78.2** | **34** | **76.5** | **42** | **76.6** | **44** | **80.0** | **43** | **83.1** | **42** | **87.0** | **41** |




Graph 2. Box plot of proportion of specific agents in intravenous form over total (%) for public acute hospitals by hospital category, from 2007 to 2012. Please see methods section for list of specific agents and see below for an explanation of the plot

Explanation of the box (or **box-and-whiskers**) plot: the bottom and top of the box are the 25th and 75th percentile (the lower and upper quartiles, respectively, so the box represents the inter-quartile range or IQR). The band near the middle of the box is the 50th percentile or the median. The ends of the whiskers represent the lowest data point still within 1.5 times the IQR of the lower quartile, and the highest data point still within 1.5 times the IQR of the upper quartile. Any data point not included between the whiskers is plotted as an outlier with a circle. Box plots are used to display differences between populations or categories without making any assumptions of the underlying statistical distribution. They help to indicate the degree of dispersion (spread) and skewness in the data, and identify outliers.

Table 3. Median proportions of specific agents in intravenous form over total (percent) for public acute hospitals by hospital category and the number of hospitals (n), from 2007 to 2012. Please see methods section for list of specific agents

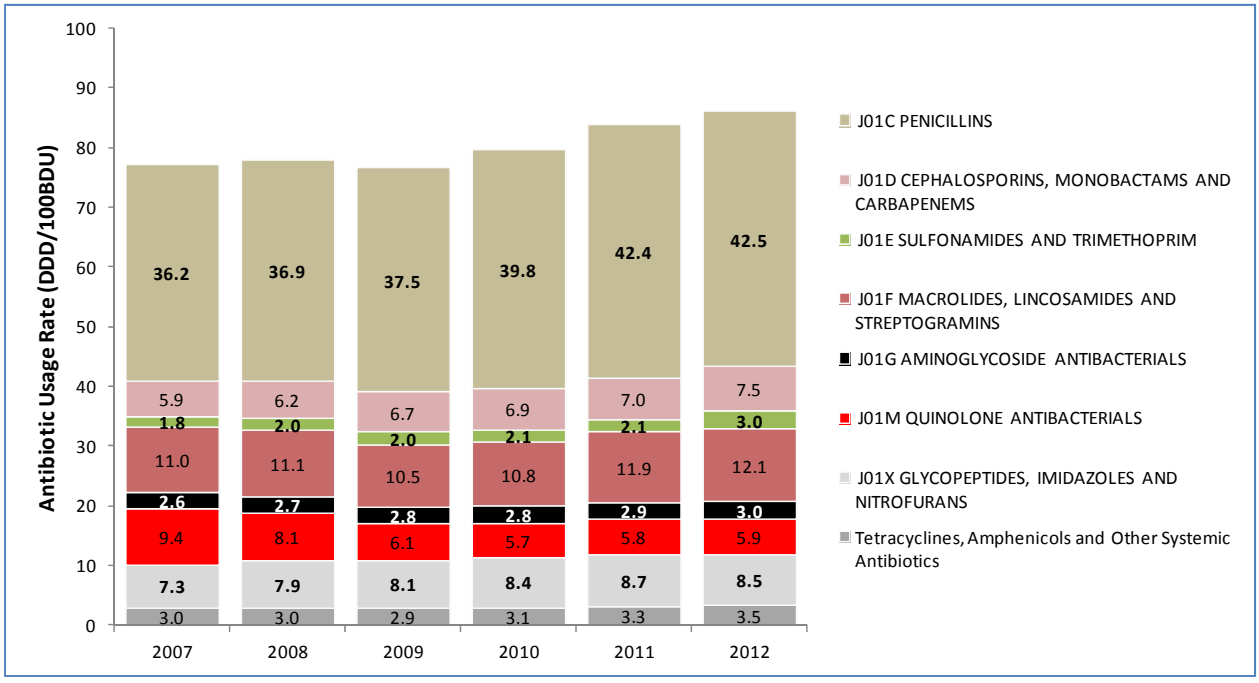
| | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Hospital Category** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **n** |
| General | 10.3 | 21 | 9.9 | 25 | 8.6 | 26 | 7.3 | 25 | 7.0 | 24 | 6.3 | 23 |
| Regional/Tertiary | 10.0 | 5 | 9.5 | 8 | 7.9 | 9 | 8.3 | 9 | 7.3 | 9 | 8.1 | 9 |
| Specialist | 7.0 | 8 | 7.1 | 9 | 6.7 | 9 | 6.8 | 9 | 6.4 | 9 | 6.5 | 9 |
| **All Hospitals** | **9.7** | **34** | **9.1** | **42** | **7.8** | **44** | **7.1** | **43** | **7.0** | **42** | **7.0** | **41** |

## SECTION D. OVERALL RATE AND BREAKDOWN BY TYPE OF ANTIBIOTICS

The overall rate (weighted mean) is calculated by adding the total antibiotic consumption values in DDD of all the participating hospitals and dividing by the sum of the BDU denominator for each hospital. Unlike the median value (Table 3), this measure is not a realistic reflection of the national level of antibiotic use as the rate can be skewed by a few large hospitals. However, this method does allow for comparison of rates of differed types of antibiotics.

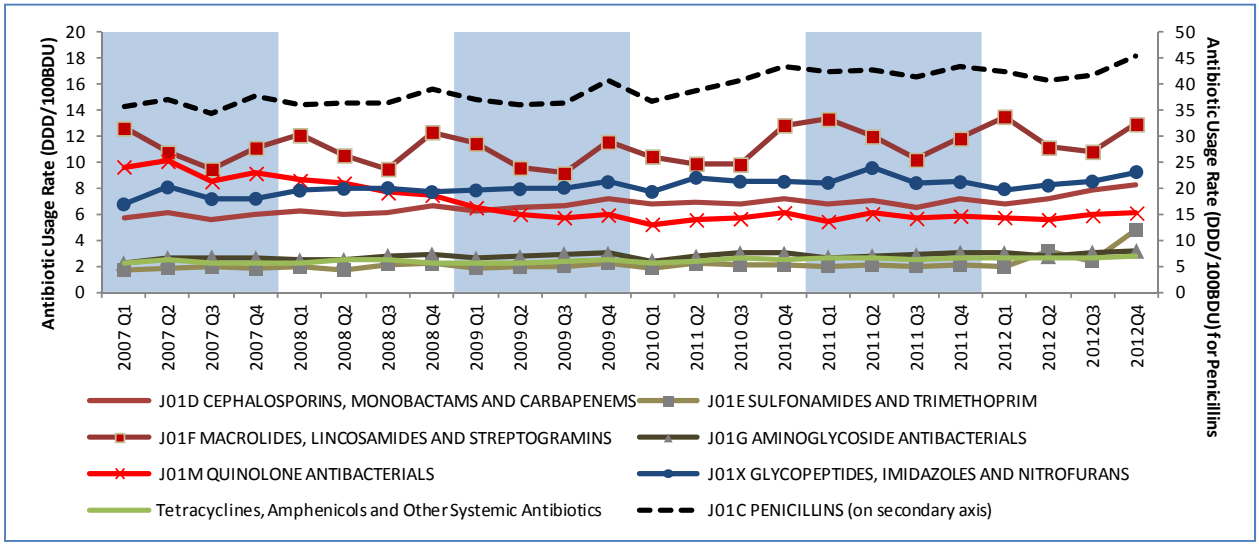
Table 4. Overall (weighted mean) antibiotic consumption rate in DDD per 100 BDU for public acute hospitals by hospital category and the number of hospitals (n), from 2007 to 2012

| | 2007 | | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** | **Rate** | **n** |
| **Overall Rate** | **77.2** | **34** | **77.9** | **42** | **76.6** | **44** | **79.5** | **43** | **83.9** | **42** | **85.9** | **41** |

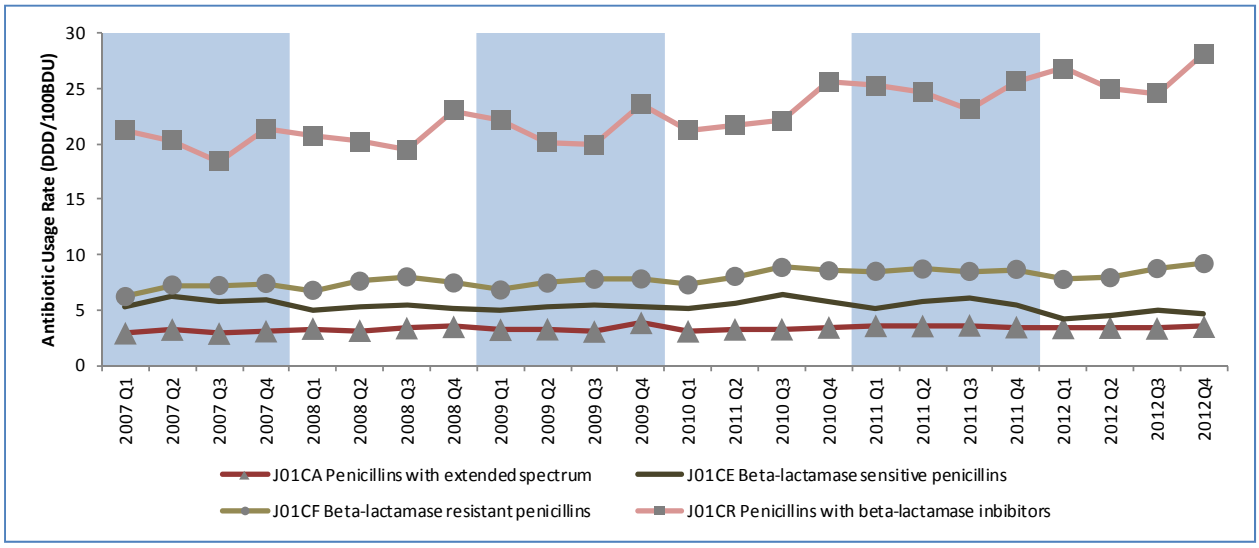



Graph 3. Antibiotic consumption grouped by pharmacological subgroup (ATC level 3) by year in public acute hospitals from 2007 to 2012

## SECTION E. QUARTERLY TRENDS




Graph 4. Antibiotic consumption grouped by pharmacological subgroup (ATC level 3). Rates are in DDD per 100 BDU as overall (weighted mean) for inpatient antibiotic consumption in public acute hospitals for all quarters from 2007 to 2012




Graph 5. Penicillin consumption breakdown by chemical subgroup (ATC level 4). Rates are in DDD per 100 BDU as overall (weighted mean) for inpatient antibiotic consumption in public acute hospitals for all quarters from 2007 to 2012

**Acknowledgement:** Hospital pharmacists for providing timely data and their helpful guidance during the analysis of the nation data. HSE-CPCP for supplying the denominator data