Antibiotic Consumption in the Community in Ireland

Are we making any progress to improve appropriate antibiotic prescribing?

REPORT FOR

2012

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Comments from

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Community Antibiotic Use-The Facts

- **The rate for Quarter 4 of 2012 (1st October to 31st December) was 24.6 Defined Daily Doses per 1000 Inhabitants per Day**
- **Antibiotic use in the community in Ireland decreased in 2008 and 2009, however, antibiotic use increased again in 2012 to 22.9 DDD**
- **In comparison to other EU countries, antibiotic use in Ireland is mid-to-high**
- **Ireland has a proportionately higher use of co-amoxiclav and macrolides within the EU, and lower use of fluoroquinolones, though there is wide variation at county level**
- **Use of specific antibiotic groups, especially co-amoxiclav and related substances, has increased while other antibiotics quinolones and second generation cephalosporins, has decreased**
- **Antibiotic use is seasonal: the average winter usage has remained higher than summer usage**

European Comparisons:

Antibiotic use in Ireland is mid-to-high compared with other EU countries

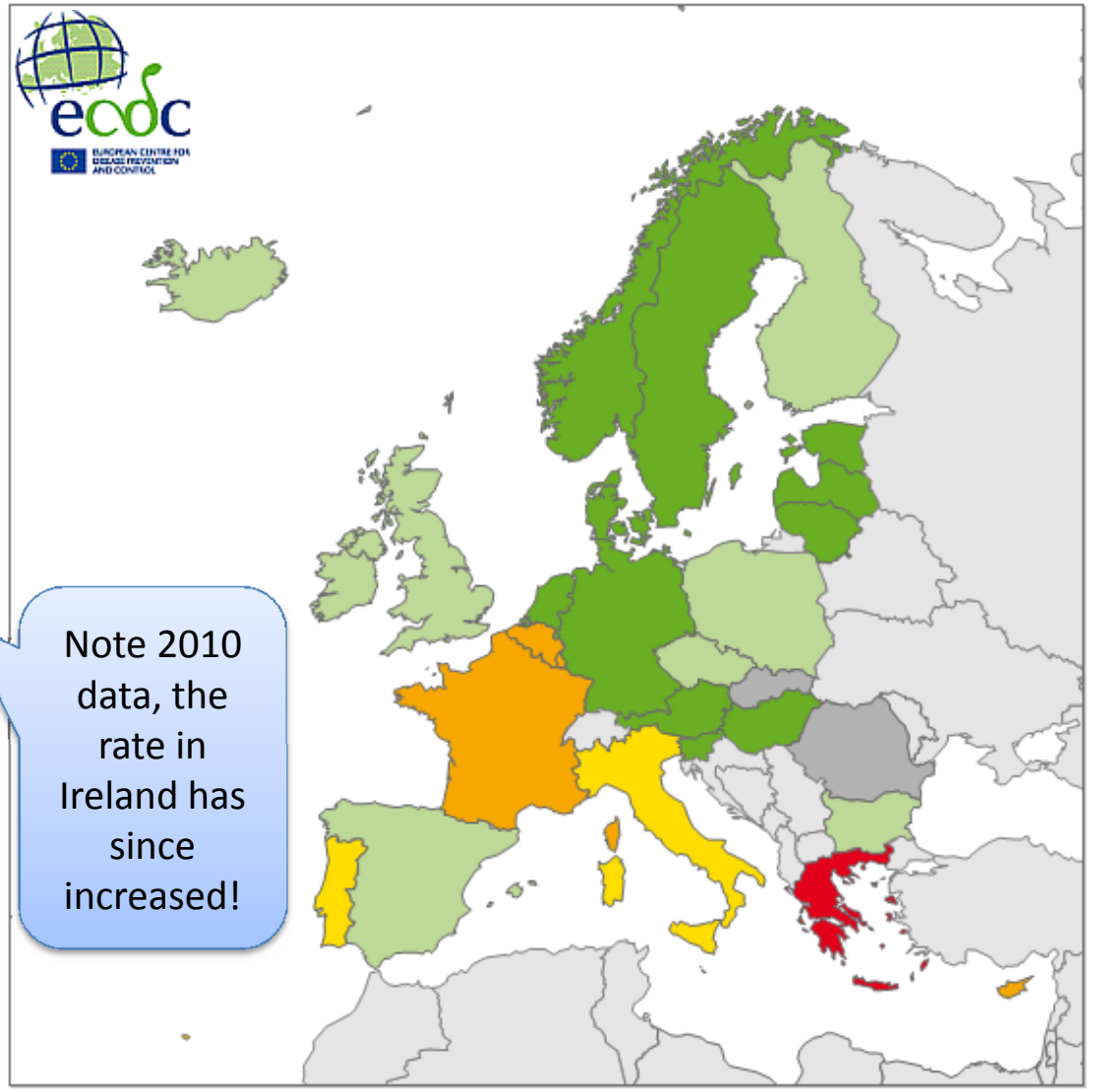


Fig 1: Total outpatient antibiotic use in Europe in 2010 expressed in DDD per 1000 inhabitants per day.

Generated from ESAC-Net data submitted to TESSy, The European Surveillance System on 2013-03-25; reflects the state of submissions in TESSy as of 2013-03-25 at 11:30. Finland: hospital sector data include consumption in remote primary health care centres and nursing homes, thus overestimating hospital consumption and underestimating community consumption compared to the other countries that report data from these sources as community consumption. Cyprus, Greece, Iceland provided only total care data.

European & Irish County Comparisons:

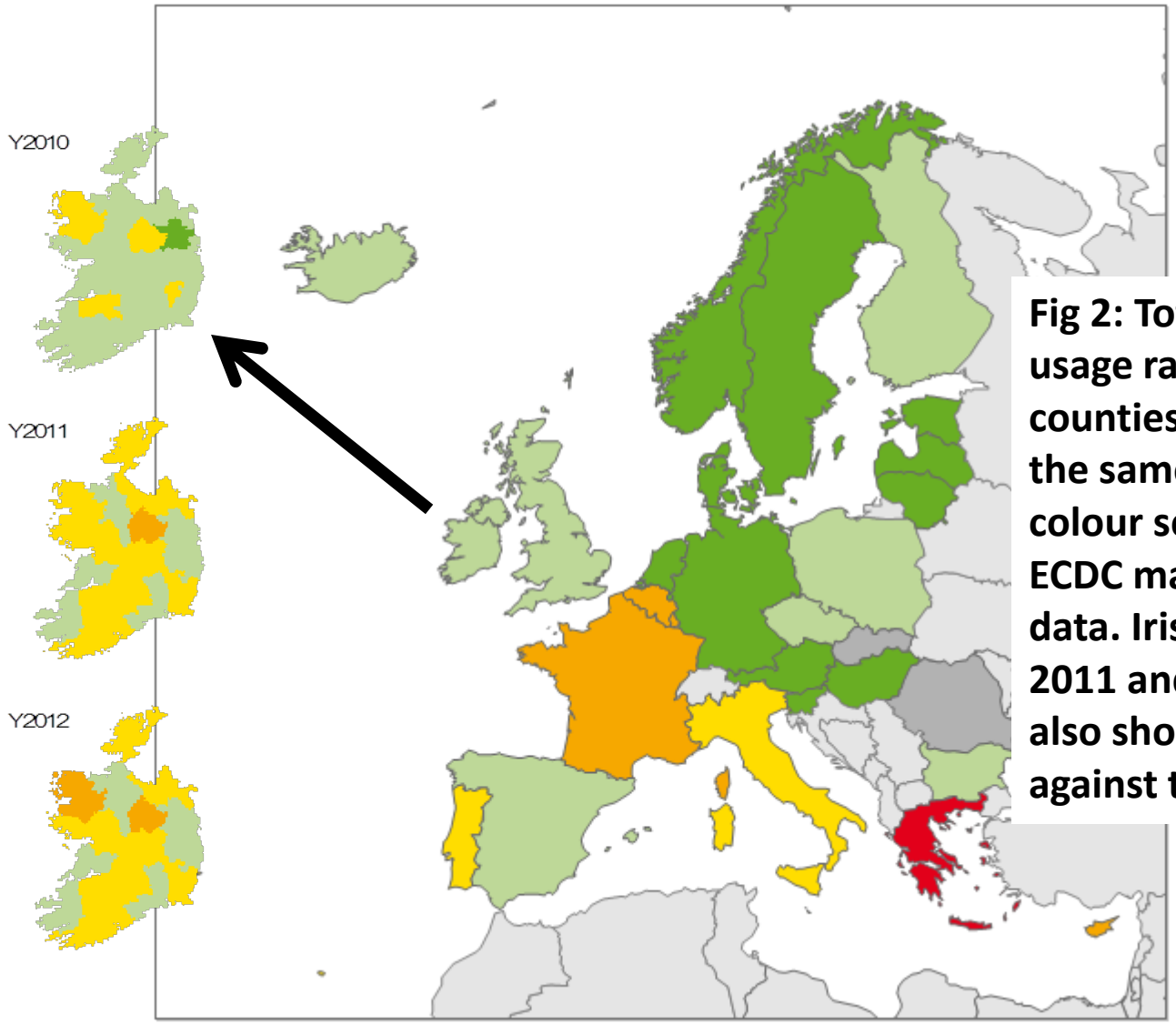


Fig 2: Total antibiotic usage rate in Irish counties shown using the same scale and colour scheme as the ECDC map for the 2010 data. Irish data for 2011 and 2012 are also shown scaled against the 2010 data.

Quarterly Changes:

The underlying trend was generally rising but declined in 2008 and 2009, though has returned to previous levels

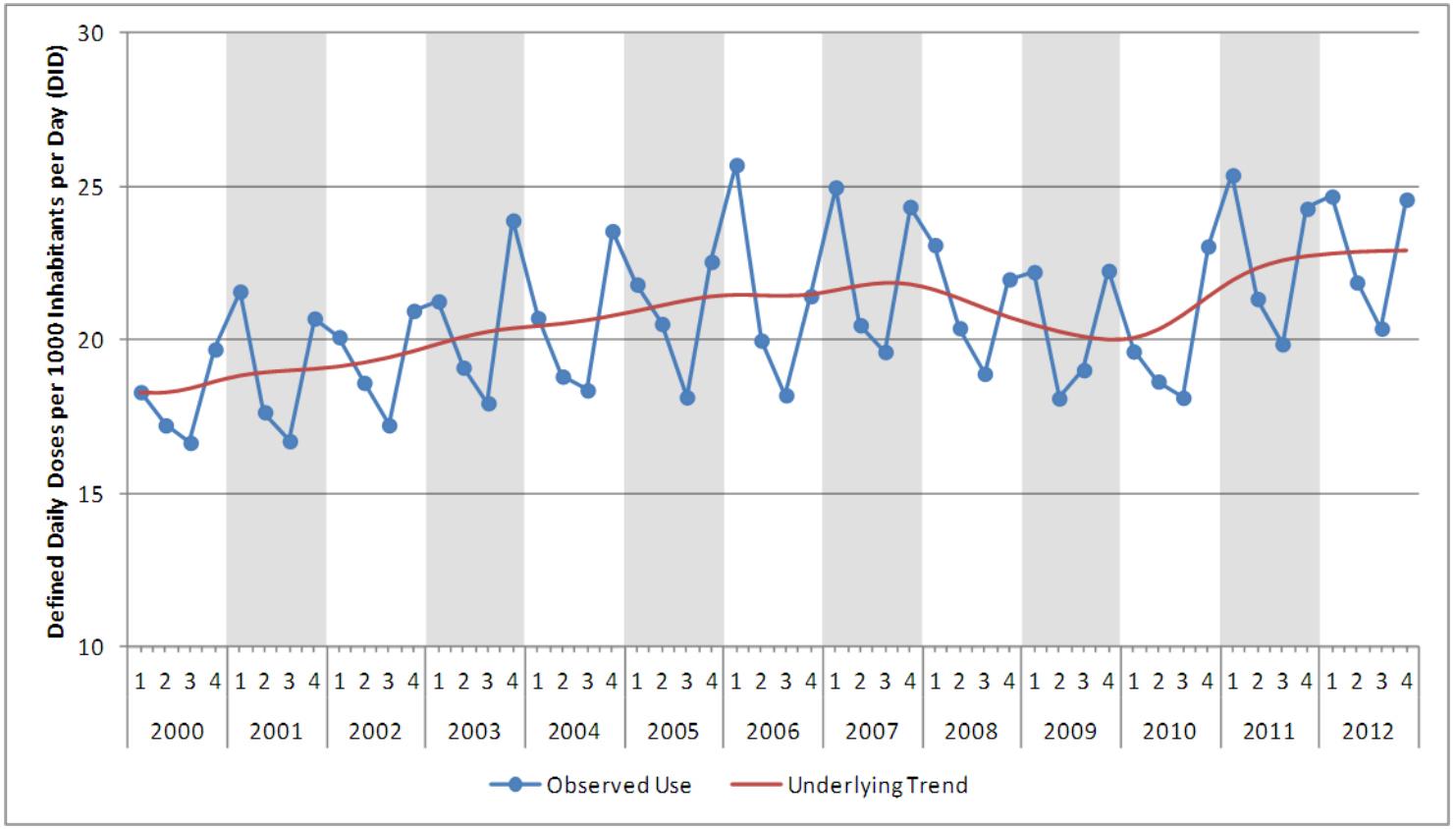


Fig 3: Total outpatient antibiotic use in Ireland from Quarter 1 of 2000 to Quarter 4 of 2012 expressed in DDD per 1000 inhabitants per day.

Monthly Changes:

Antibiotic use in 2012 is in line with rates for the last four years, though slightly higher and greater rise in November

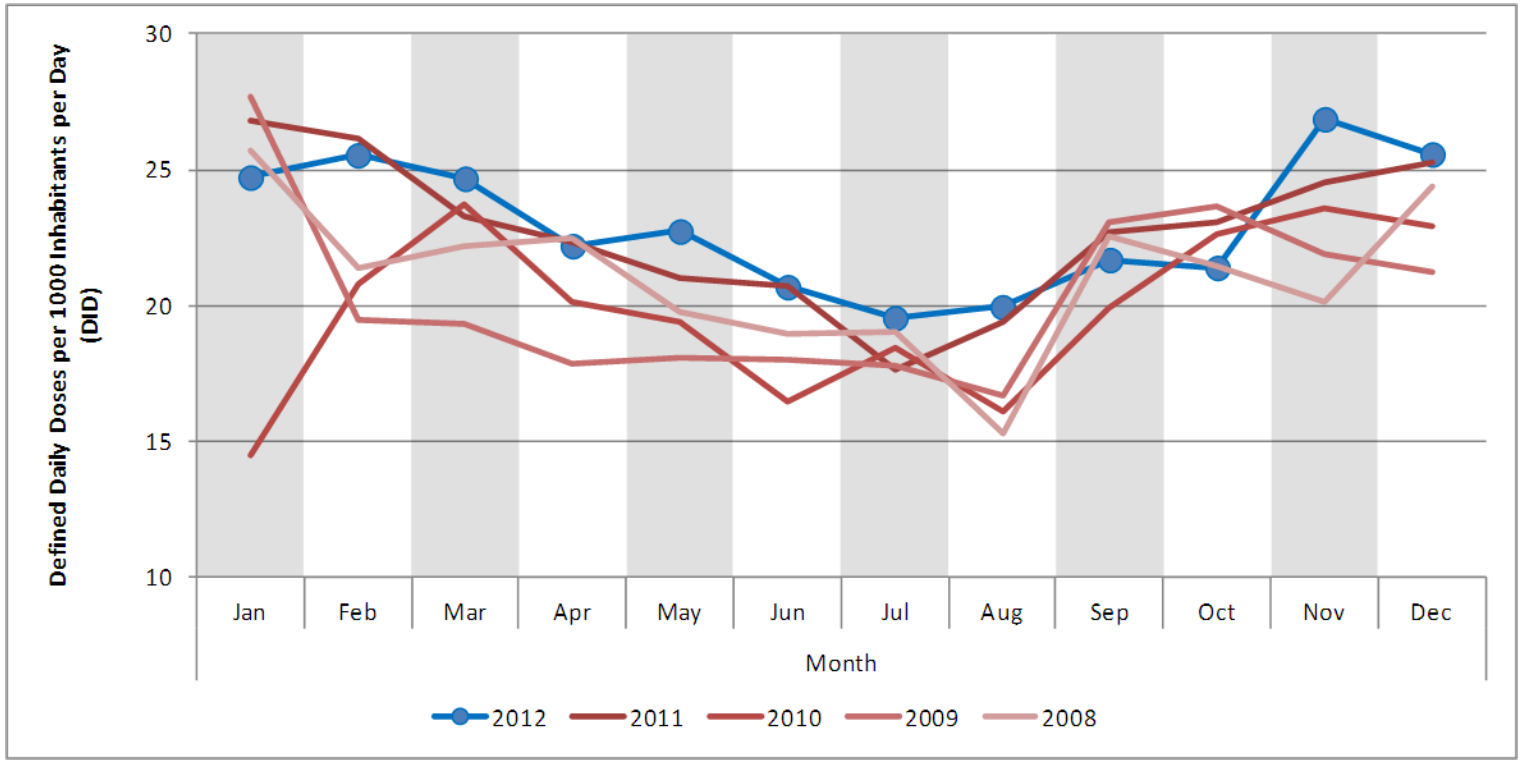


Fig 4 : Total outpatient antibiotic use in Ireland by month from January 2008 to December 2012 expressed in DDD per 1000 inhabitants per day.

Yearly Changes in Cost:

Total ingredient cost increased slightly to €43M for 2012 compared to €42M in 2011

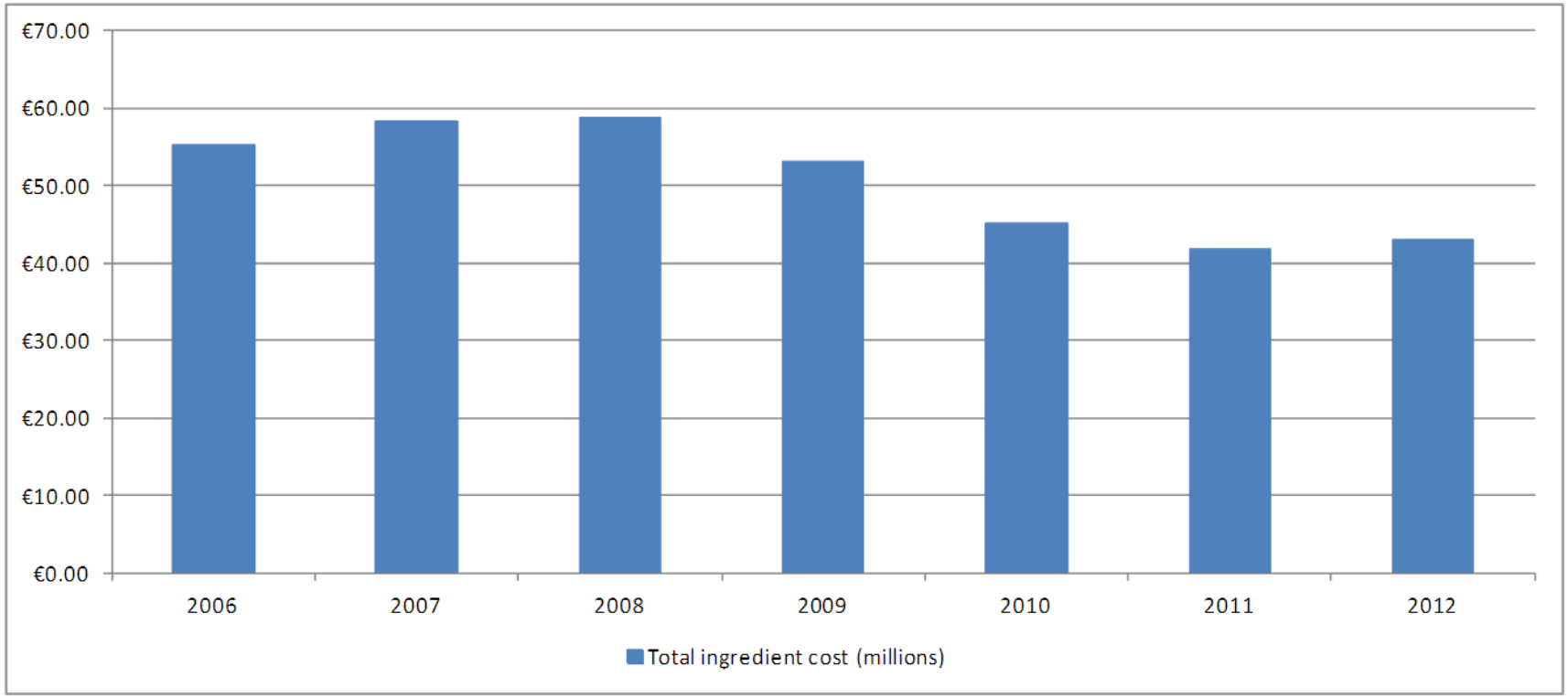


Fig 5: Total ingredient cost of outpatient antibiotic use in Ireland 2006 to 2012 in millions of Euro.

Latest Data- By antibiotic class

Table 1 : Total outpatient antibiotic use in Ireland for 2011 and 2012, and the last quarter of 2012 expressed in DDD per 1000 inhabitants per day.

	2011	Percent of 2011	**2012**	Percent of 2012	Percent Change 2011 to 2012	2012Q3	2011Q4	**2012Q4**	Percent Change 2011Q4 to 2012Q4
Penicillins	12.3	54.0%	12.5	54.6%	1.9% ▲	11.1	13.1	13.3	2.1%
Narrow spectrum penicillins	1.0	4.4%	1.0	4.4%	1.1%	1.0	1.0	1.0	-2.8%
Beta-lactamase resistant penicillins	1.0	4.6%	1.0	4.6%	-0.1%	1.2	1.0	1.0	-0.4%
Broad spectrum penicillins	3.6	15.7%	3.7	15.9%	2.3% ▲	3.2	3.8	3.8	-1.9%
Penicillin with beta-lactamase inhibitor	6.7	29.3%	6.8	29.7%	2.1% ▲	5.8	7.2	7.5	5.4%
Macrolides and related drugs	4.2	18.4%	4.2	18.2%	-0.7% ▼	3.4	4.7	4.7	-0.1%
Tetracylines	2.8	12.3%	2.9	12.8%	4.6% ▲	2.8	2.9	3.0	3.9%
Cephalosporins and other beta-lactam drugs	1.2	5.3%	1.2	5.2%	-2.1% ▼	1.0	1.3	1.4	6.2%
First-generation cephalosporins	0.2	0.7%	0.2	0.8%	7.5%	0.2	0.2	0.2	8.4%
Second-generation cephalosporins	0.9	4.1%	0.9	4.0%	-3.3%	0.7	1.0	1.1	6.9%
Third-generation cephalosporins	0.1	0.5%	0.1	0.4%	-6.0% ▼	0.1	0.1	0.1	-4.3%
Quinolones	0.9	4.1%	0.9	3.8%	-6.6% ▼	0.9	1.0	0.9	-9.1%
Sulfonamides and Trimethoprim	1.2	5.2%	1.2	5.0%	-2.9% ▼	1.2	1.3	1.2	-3.7%
Other antibiotics	0.1	0.6%	0.1	0.5%	-24.6%	0.1	0.1	0.1	-22.2%
TOTAL	**22.7**	**100.0%**	**22.9**	**100.0%**	**0.8%** ▲	**20.4**	**24.3**	**24.6**	**1.2%**

Quarterly Changes - Pharmacological Subgroup:

Rate for penicillins and macrolides increased while quinolones and cephalosporin rates decreased

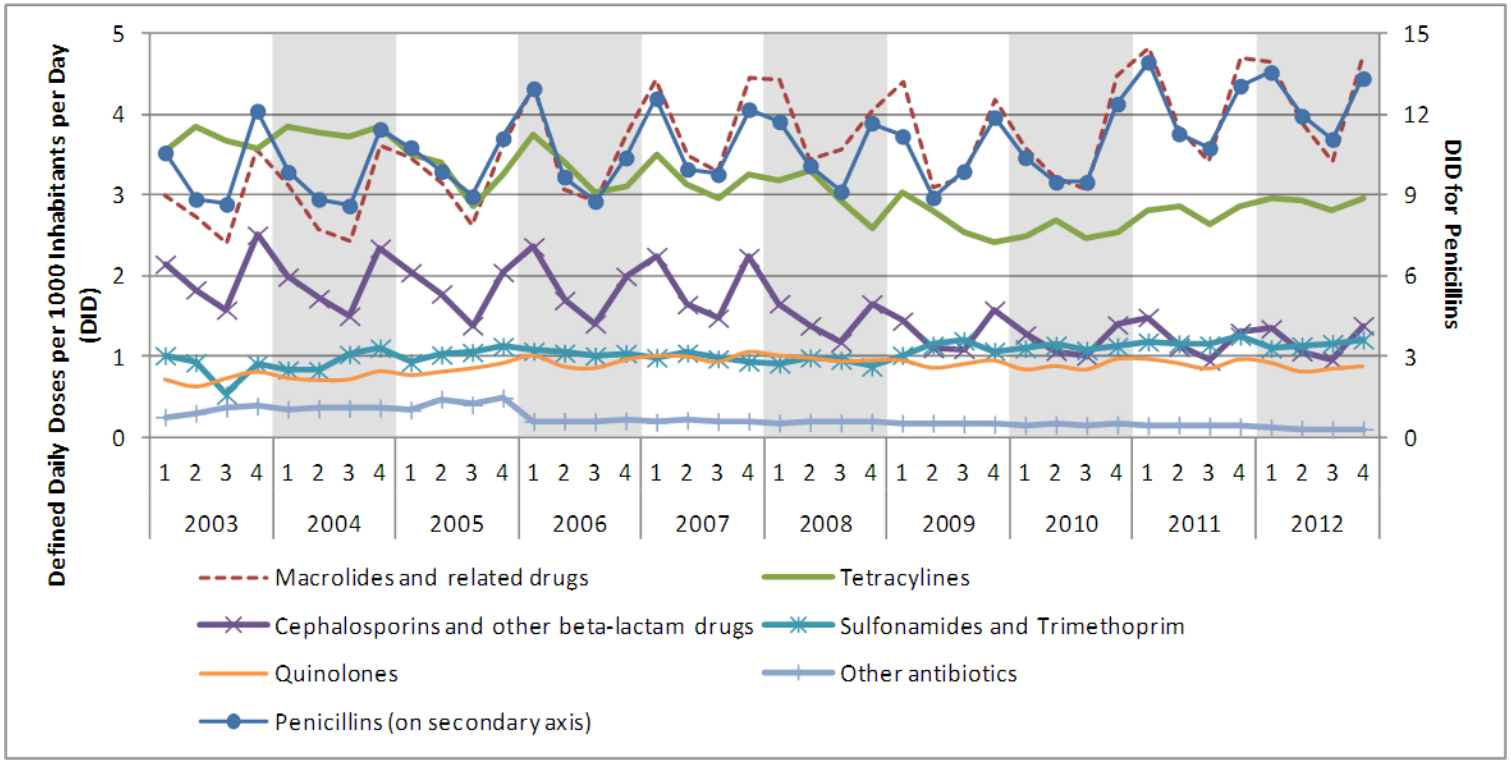


Fig 6: Antibiotic use in Ireland outpatient care from Q1 of 2003 to Q4 of 2012 expressed in DDD per 1000 inhabitants per day by pharmacological subgroup (ATC level 3).

Quarterly Changes – Penicillins:

Penicillin with beta-lactamase inhibitor (such as co-amoxiclav) use is increasing

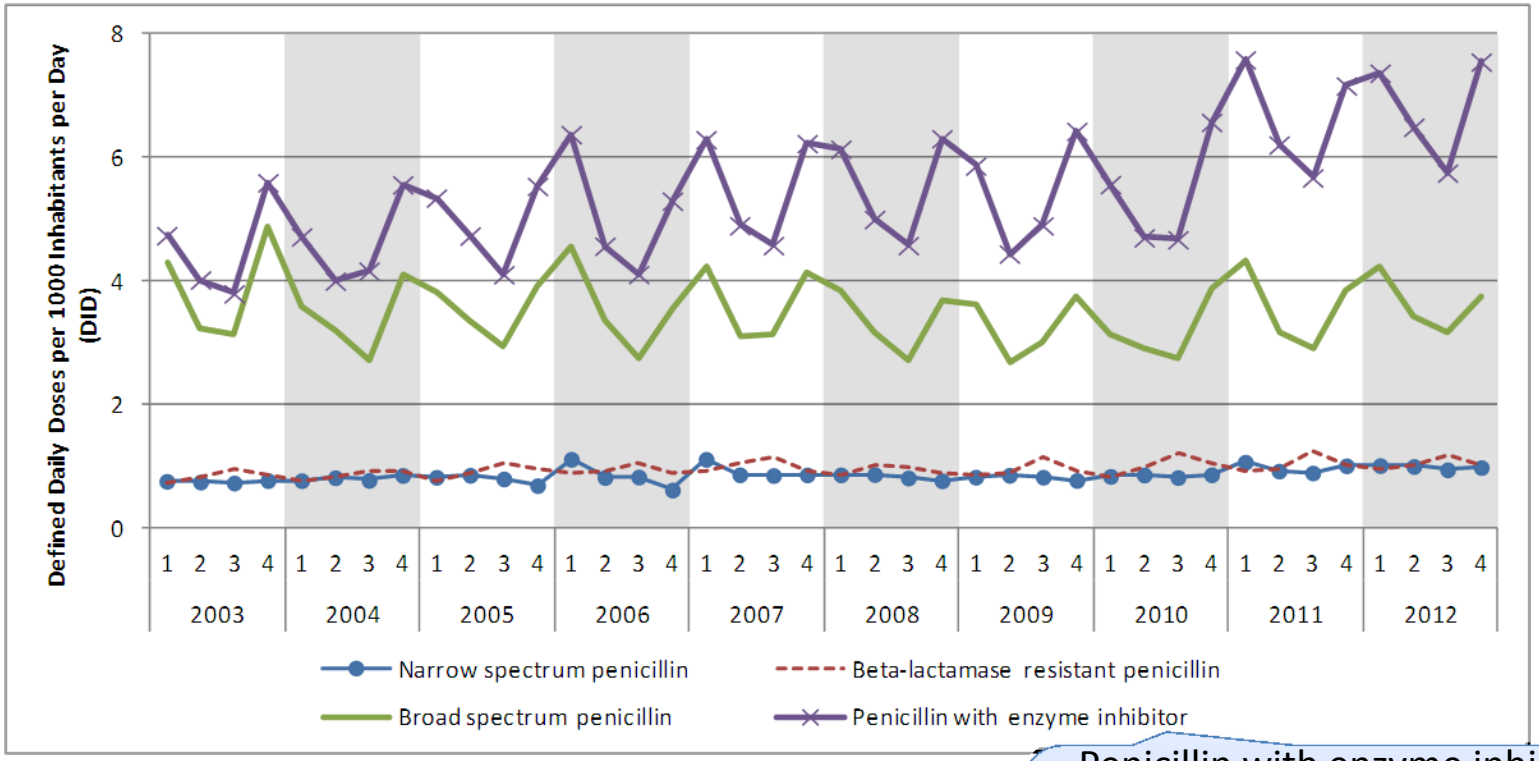


Fig 7: Antibiotic use in Ireland outpatient care from Q1 of 2003 to Q4 of 2012 expressed in DDD per 1000 inhabitants per day by penicillin subgroup (ATC level 4).

Penicillin with enzyme inhibitor (such as co-amoxiclav) is not a first-line drug for the common conditions encountered in General Practice

Quarterly Changes – Cephalosporins:

Use of second generation cephalosporins decreased in 2008 to a new annual level

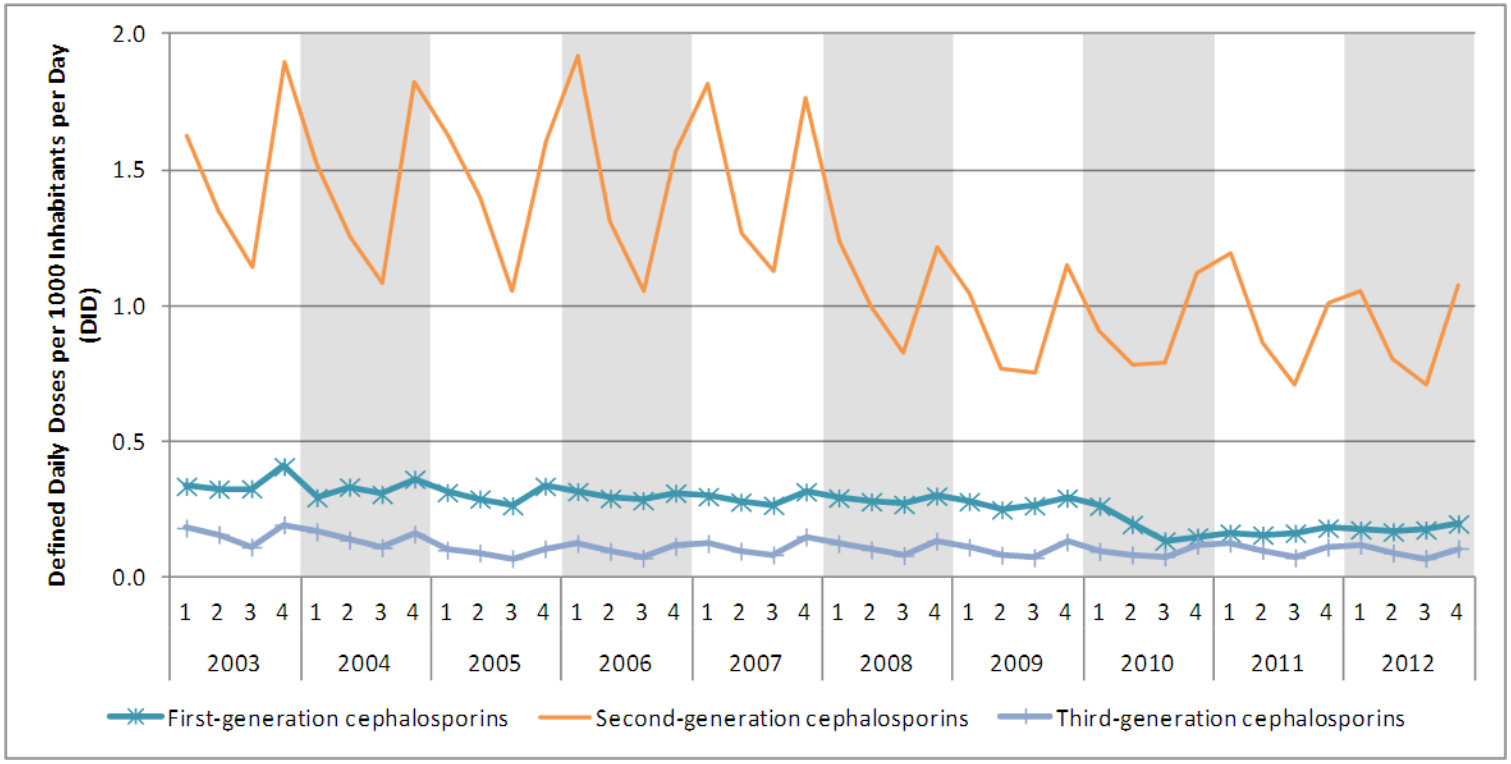
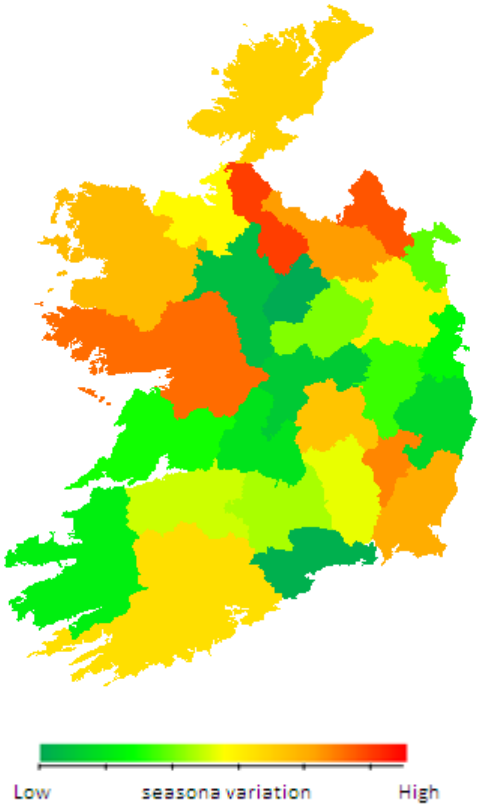


Fig 8: Antibiotic use in Ireland outpatient care from Q1 to 2003 to Q4 of 2012 expressed in DDD per 1000 inhabitants per day by cephalosporin subgroup (ATC level 4).

Seasonal Fluctuations – Counties, 2012



Why is there so much seasonal fluctuation in antibiotic usage in Ireland and why is this so varied across the counties?

Fig 9: Seasonal variation of total antibiotic consumption (winter quarters over summer quarters expressed as percentage) in 2012 varied from 8% to 31% at county level and was 17% overall for Ireland.

2011 Census used for rate calculations.

Effects of Influenza:

Seasonal fluctuation with high winter peaks has remained strong over the years. Note: Modelled use takes into account periods of high influenza activity

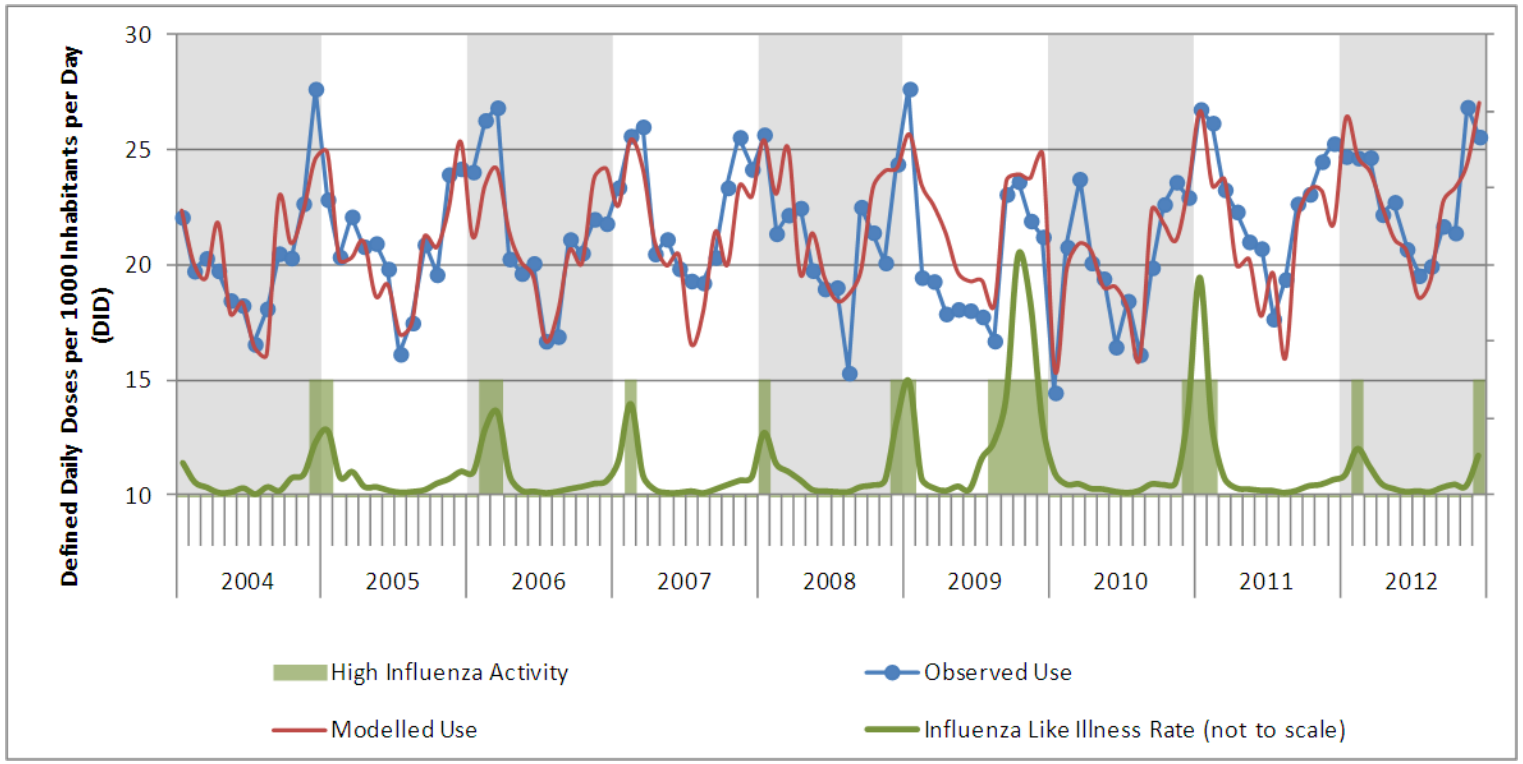


Fig 10: Total outpatient antibiotic use in Ireland from January 2004 to December 2012 expressed in DDD per 1000 inhabitants per day.

Antibiotic Groups – Counties, 2012

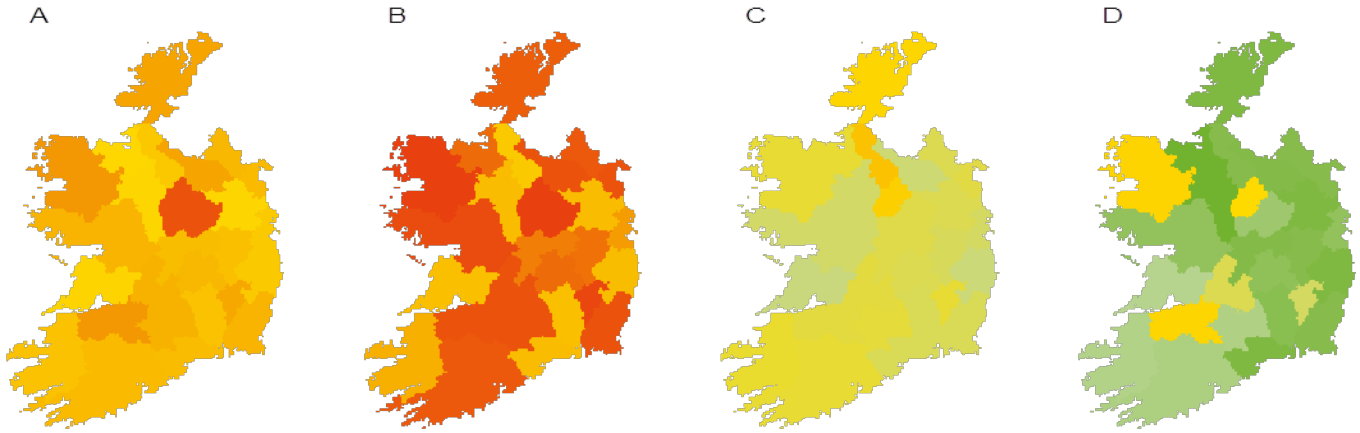


Fig 11:

A. Penicillins	Consumption of penicillins (J01C) expressed in DDD per 1000 inhabitants and per day. E.g. Amoxillin or Co-amoxiclav
B. Marcolides	Consumption of macrolides, lincosamides and streptogramins (J01F) expressed in DDD per 1000 inhabitants and per day. E.g. Clarithromycin
C. Cephalosporins	Consumption of cephalosporins (J01D) expressed in DDD per 1000 inhabitants and per day. E.g. Cefaclor
D. Quinolones	Consumption of quinolones (J01M) expressed in DDD per 1000 inhabitants and per day. E.g. Ciprofloxacin

For figures 11 and 12, the same type of scheme as the one in fig 1 is used for eight ECDC (ESAC-Net) quality indicators to show variation in Irish counties scaled against ECDC 2010 data. The scale has been graduated to show greater contrast between counties.

Antibiotic Groups – Counties, 2012

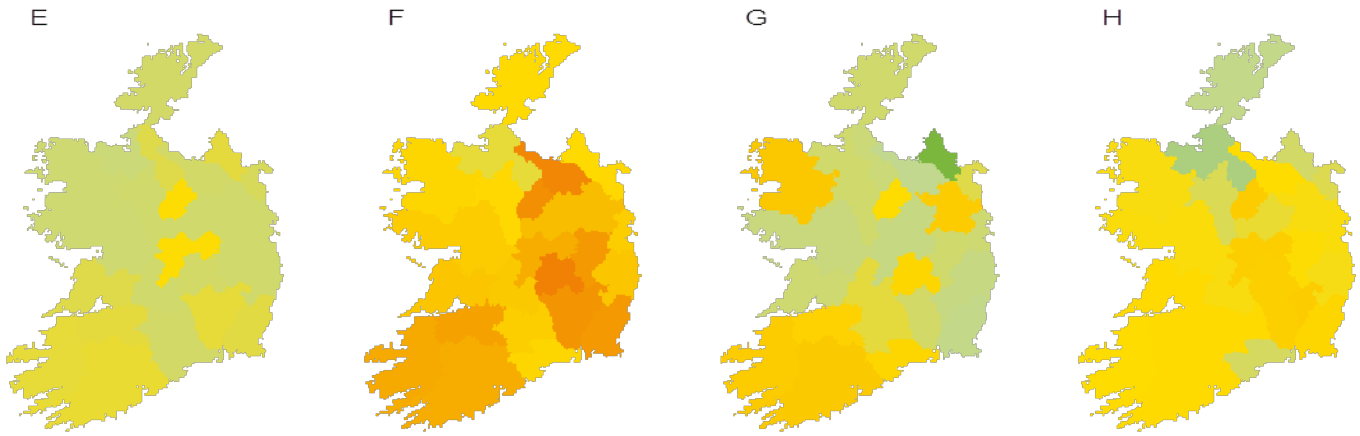
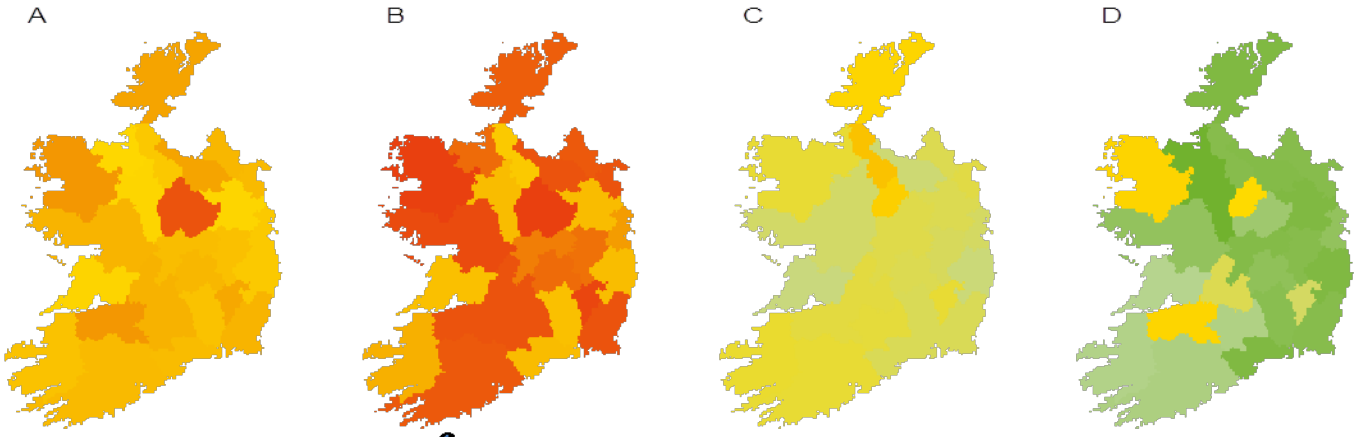


Fig 12:

E. Narrow Spec Penicillins	Consumption of beta-lactamase sensitive penicillins (J01CE) expressed as percentage of the total consumption of antibacterials for systemic use (J01). E.g. Phenoxymethylpenicillin. ^This measure is inverted
F. Penicillins with Enzyme Inhib.	Consumption of combination of penicillins, including beta-lactamase inhibitor (J01CR) expressed as percentage of the total consumption of antibacterials for systemic use (J01). E.g. Co-amoxiclav
G. Third Gen Cephalosporins	Consumption of third and fourth generation of cephalosporins (J01(DD+DE)) expressed as percentage of the total consumption of antibacterials for systemic use (J01). E.g. Cefixime. No 4th gen ceph use in Ireland
H. Broad V Narrow	Ratio of the consumption of broad (J01(CR+DC+DD+(F-FA01))) to the consumption of narrow spectrum penicillins, cephalosporins and macrolides (J01(CE+DB+FA01))

Antibiotic Groups – Counties, 2012

Fig 11:



Why is the use of macrolides so high in Ireland compared to Europe? There is no evidence that penicillin allergy is higher here.

Why is there so much county-wide variation for quinolones and antibiotic usage in general in Ireland?

Positive changes v Where we can improve

	Yearly Change (2011 to 2012)	Recent Trend	Compared to Europe	County-Level Varation	Seasonality	
Penicillins (e.g. amoxicillin, co-amoxiclav)	Up	Up	Mid-high	Mid	High	
Penicillin with beta-lactamase inhibitor (e.g. co-amoxiclav)	Up	Up	Mid-high	High	High	
Macrolides and related drugs (e.g. clarithromycin)	Down	Up	High	Mid	High	
Tetracylines (e.g. doxycycline, minocycline)	Up	Up	Mid	Mid	Low	
Cephalosporins and other beta-lactam drugs (e.g. cefaclor, cefixime)	Down	Down	Low	Mid	High	
Third-generation cephalosporins (e.g. cefixime)	Down	Slightly up	Mid	High	Low	
Quinolones (e.g. ciprofloxacin)	Down	Flat	Very low	High	Low	
Overall Antibiotic Use	**Slightly up**	**Up**	**Mid-high**	**High**	**High**	

Observations and tips on appropriate prescribing

- The low level use in some broad-spectrum drugs is encouraging, in particular
  - Quinolones (such as ciprofloxacin), cephalosporins and specifically 3rd generation cephalosporins (such as cefixime)

  ⏩ ***Continue usage at low levels***

- The high level use in other broad-spectrum is discouraging, in particular
  - Penicillin with enzyme inhibitor (such as co-amoxiclav)

  ⏩ ***Use narrow-spectrum penicillins where possible***

- The high degree of seasonal variation is discouraging

  ⏩ ***Excess use in winter should be curtailed***

- The high degree in county-level variation is discouraging

  ⏩ ***Greater standardisation in prescribing is advised***

"Keeping antibiotics effective for future generations is everyone's responsibility"

Every time you prescribe you need to ask yourself:

- Is this antibiotic prescription necessary?
- Would a delayed prescription suffice?
- Is it the correct/narrow spectrum antibiotic for the infection I am treating?
- Is the dose/duration right for the patient in front of me?
- Have I checked www.antibioticprescribing.ie ?

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Health Care Associated Infections and Antimicrobial Drug Resistance

Methods

- Irish antibiotic sales data were from IMS Health, a pharmaceutical market research company. This dataset contains regional, monthly wholesaler to retail pharmacy sales data from over 95% of the wholesalers and manufacturers in Ireland.
- Consumption is measured in Defined Daily Dose (DDD), which is the assumed average maintenance dose per day for a drug used for its main indication in adults. The current WHO Anatomical Therapeutic Chemical index was used to classify the antibiotics.
- Rates were calculated in DDD per 1000 inhabitants per day (DID) for the outpatient antibiotic consumption data. Updated population size estimates were obtained from the Central Statistics Office and used to calculate monthly and quarterly rates. Values for 2012 were projected from census data since 1996.
- Monthly expected usage values were calculated from time-series data using an ARIMA transfer model in which the influenza-like illness level over the national threshold was used a binary event variable along with a point for Jan 2010 when drug sales were impacted by sever weather conditions. The underlying trend on the quarterly graph was derived via seasonal decomposition.

Further information

- See: Guidelines on HPSC Website
  - Antibiotic prescribing guidelines in primary care
    - Also www.antibioticprescribing.ie
  - Diagnosis and management of urinary tract infection in residents of long term care facilities
  - Hand hygiene, MRSA, *C. difficile* and many other guidelines
- European Surveillance of Antimicrobial Consumption Network (ESAC-Net)
- WHO Collaborating Centre for Drug Statistics Methodology (for ATC-DDD method)