

How do Regional Differences in Antibiotic Consumption Correlate with the Number of Trade Names in a Market?

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BACKGROUND

- The variation in antibiotic consumption across regions and countries is important to understand the emergence of drug-resistant pathogens.
- United States characterized by high antibiotic consumption and a shift towards newer antibiotics (Goossens et al 2004).
- Bergman et al (2006), point to the potential impact of this trend, finding that more consumption of macrolides and azithromycin increased macrolide resistance.
- There is a substantial difference in antibiotic prescription rates between 13 European Countries (Molstad et al 2002).
- Significant geographic and quarterly variation in outpatient antibiotic prescriptions exist in the United States also, especially among adults (Zhang et al in 2012).

What determines antibiotic use?

- Across five European countries and eight antibacterial classes, Monnet, et al. (2005) found a positive relationship between consumption and the **number of trade names** of oral antibacterial agents.
- Competition** in antibiotic market associated with higher prescription rate of drugs possibly through lower prices (Bennett 2011)

OBJECTIVE

- To investigate whether the positive relationship between community consumption and the number of trade names exhibited in European countries holds true on a worldwide scale

METHODS

Data Source: IMS Health's Multinational Integrated Data Analysis System (MIDAS)

Variables of Interest

- Quantity consumed (in Std. units per capita)
- The number of trade names for all drugs

Other data features

- Only drugs listed as aminopenicillins (ATC class J01G) and oral fluoroquinolones (ATC class J01C1) included.
- Monthly data spans 1999-2010 and covers retail channels, including private or public pharmacies.
- Data were obtained for 60 countries worldwide excluding China and India

RESULTS

Table 1— Correlations between antibiotic consumption and the number of trade names for two antibiotic classes in 60 countries

| Level of Analysis | r | P-value |
|-----------------------------|--------|---------|
| A. Overall (All Years) | 0.150 | 0.003 |
| B. By Region | | |
| Aminopenicillins | 0.220 | 0.003 |
| East Asia& Pacific | 0.1000 | 0.950 |
| Europe& Central Asia | 0.380 | 0.051 |
| Latin America & Caribbean | -0.390 | 0.240 |
| Middle East & Africa | 0.620 | 0.041 |
| North America & South Asia | 0.800 | 0.330 |
| Oral Fluoroquinolones | -0.030 | 0.670 |
| East Asia& Pacific | -0.600 | 0.350 |
| Europe& Central Asia | 0.623 | 0.0005 |
| Latin America & Caribbean | -0.510 | 0.110 |
| Middle East & Africa | -0.290 | 0.095 |
| North America & South Asia | -0.800 | 0.333 |
| C. By Income | | |
| High Income | 0.290 | 0.018 |
| Upper Middle Income | 0.084 | 0.620 |
| Low and Lower Middle Income | -0.130 | 0.700 |

RESULTS

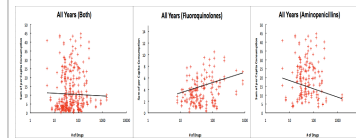
Overall (Both Antibiotic classes and all regions)

- Weak positive relationship between antibiotic consumption and the number of trade names in the market.
- Similar relationship, but weaker than reported by Monnet et al. 2005 (r-value = 0.56).

By Antibiotic Classes (Figure 1)

- Aminopenicillins have a negative relationship between consumption and the number of trade names with an r-value of 0.22
- Fluoroquinolones do not have a statistically significant relationship.

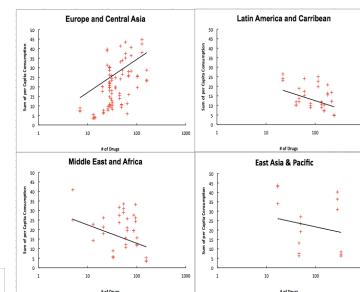
Figure 1— Scatter plots showing the correlation between community use and the number of trade names for antibiotic classes in 60 markets worldwide. Left contains data for both antibiotic classes. Middle and Right contains data for fluoroquinolones and aminopenicillins, respectively.



By Region (Figure 2)

- Strong, positive relationship between consumption and the number of trade names in the Europe & Central Asia regions for both the aminopenicillins and fluoroquinolones antibiotic classes, with r-values of 0.38 and 0.62, respectively.
- The Middle East & Africa, exhibits a moderate negative relationship between fluoroquinolones consumption and the number of trade names (r=-0.29) and a strong positive relationship for aminopenicillins (r=0.62)
- The aminopenicillin class mirrors the results in Monnet et al more closely with only Latin America and the Caribbean sloping negatively.

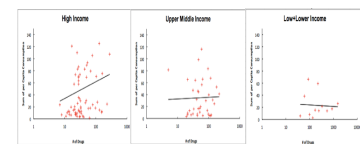
Figure 2— Scatter plots for the oral fluoroquinolone antibiotic class showing regional differences in the relationship between community use and the number of trade names. North America and South Asia are omitted due to insufficient data points (n<10).



By Income (Figure 3)

- High Income countries:** Moderate positive relationship (r=0.29) between consumption and the number of trade names.
- Upper Middle Income countries:** No statistically significant relationship
- Low and Lower Income countries:** No statistically significant relationship.

Figure 3— Scatter plots for fluoroquinolones showing income differences in the relationship between community use and the number of trade names. Income designations are based on World Bank categorization



CONCLUSION

- A positive relationship between community consumption and the number of antibacterial trade names holds true in many, but not all, situations.
- Pooled data shows a weak positive relationship between consumption and the number of trade names.

By Antibiotic Class

- Aminopenicillins have a moderate positive relationship with consumption
- Fluoroquinolones class do not have a statistically significant relationship.

By Region

- Europe & Central Asia shows a positive relationship between consumption and the number of trade names for both classes of drugs.
- The Middle East shows a moderately negative relationship for Fluoroquinolones but a strong positive relationship for Aminopenicillins
- Other regions do not have a statistically significant relationship between consumption and trade names

By Income

- High income countries have a moderate positive relationship

LIMITATIONS

- There were more countries in the Europe& Central Asia region included in the study compared to the other regions due to data availability.
- Some countries were excluded for the income and region specific correlations since they did not have data available for every year in the decade.
- IMS audits may not cover 100% of the retail sales.

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