

MORPHEUS – Policy Brief No. 1 Pharmaceutical Consumption

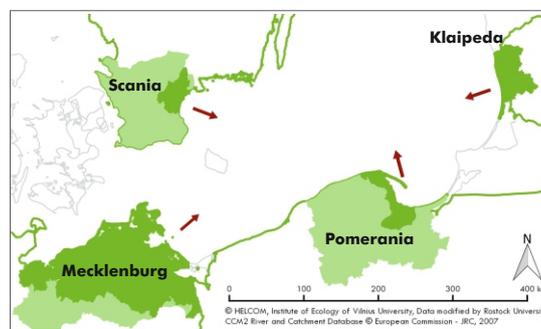
Pharmaceutical consumption patterns in South Baltic Sea regions differ: Comparing Sweden, Germany, Poland and Lithuania

Summary

Consumption of pharmaceuticals differs between countries, regions and even cities. A comparative analysis conducted in MORPHEUS confirmed that distribution patterns depend on doctor's prescriptions, season of the year, and age of the population. A part of each consumed medicine ends up in wastewater treatment plants (WWTPs), and eventually find their way to rivers, lakes and the South Baltic Sea since many of them are not removed sufficiently in today's WWTPs. Investigating the local consumption patterns is recommended to understand which pharmaceuticals are most relevant in which region. Combining this knowledge with chemical analysis of pharmaceuticals in WWTPs and receiving water bodies will aid in prioritization processes and making wiser investments in advanced treatment technologies to remove relevant pharmaceuticals from the local wastewater and the aquatic environment.

Background and aim – MORPHEUS

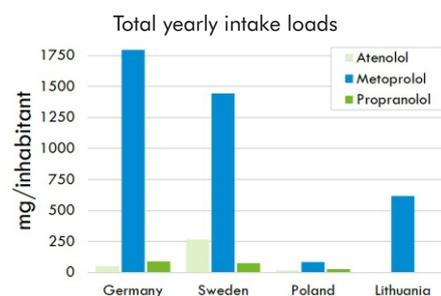
The aim of MORPHEUS is to support actions in reducing the constant release of pharmaceutical substances via WWTPs to the South Baltic Sea. Therefore, MORPHEUS integrates information on pharmaceutical consumption, existing technologies and release rates of selected WWTPs as well as environmental occurrence downstream in the coastal regions Mecklenburg (Germany), Skåne (Sweden), Pomerania (Poland) and Klaipeda (Lithuania). This information can aid wastewater treatment utilities and authorities in a future implementation of a suitable advanced treatment technology.



Key findings – exemplified by selected pharmaceuticals

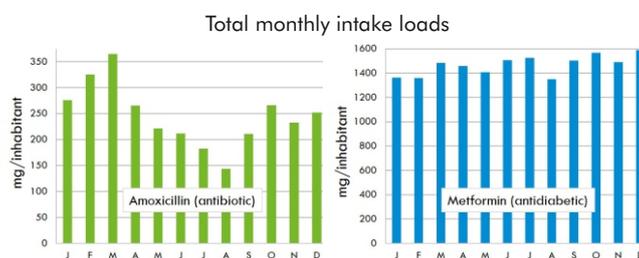
1. Consumption of individual pharmaceuticals is country-specific.

In all Model Areas, heart medicines are prescribed or refunded. Metoprolol is the highest consumed beta-blocking substance out of 3 investigated. The yearly intake in Sweden and Germany is distinctly higher than 1400 mg/inhabitant, while Poland and Lithuania do not exceed 100 and 620 mg/inhabitant, respectively. This will effect the burden on the WWTPs.



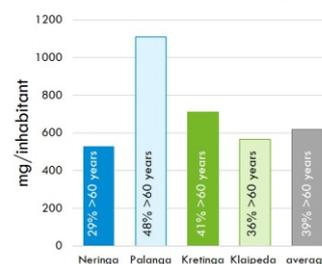
2. Consumption of some medicines vary with season, while others do not.

The intake load of Metformin for treating diabetes is nearly steady, with a variation of about 5.5% between the monthly intake loads. The intake loads of the antibiotic Amoxicillin is much higher in the winter/spring season than in the summer season. The results seem to be reasonable since the risk of bacterial infections, colds etc. is much higher in winter/spring than in summer. (Data from Poland)



3. Consumption of some compounds differ between cities due to differing age structure.

Metoprolol consumption per inhabitant is the highest in Palanga, a seaside resort in Lithuania. Beta-blocking substances (heart medicines) are mostly consumed by elderly people. This correlates with the demographic structure of Palanga which has a higher share of elderly inhabitants (>60 years) than other municipalities. (Data from Lithuania)



All data investigated for 2015.

All results and full reports available at: www.morpheus-project.eu

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International comparison of yearly consumption per inhabitant of 22 selected pharmaceuticals in Germany, Sweden, Poland and Lithuania

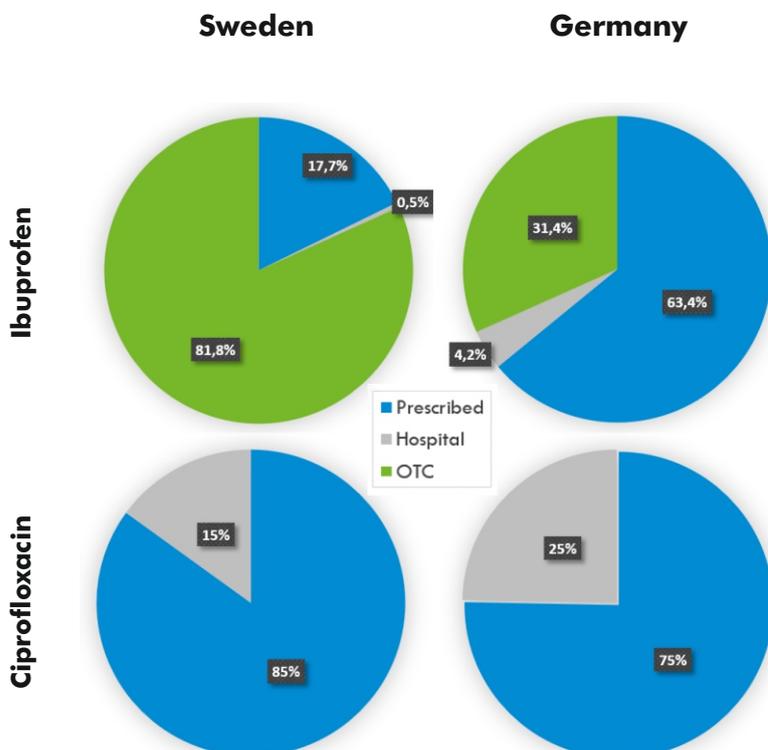
For the purpose of international comparison of pharmaceutical consumption the results of the investigated regions were normalized to yearly consumption loads expressed as intake per inhabitant [mg/inh.]. The calculations allow an initial idea of the main differences and similarities in consumption. Germany and Sweden are more comparable with one another, as are Lithuania and Poland with one another, due to different health care systems and resulting data formats/availabilities; prescriptions vs. refunding, respectively.

Nevertheless, similar trends were found for e.g. Metformin with intake loads >9,000 mg/inh. overall. On the contrary, the antibiotic Clarithromycin is much more applied in Germany and Poland than in Sweden and Lithuania.

This analysis shows the consumption of selected pharmaceuticals and does not cover the total pharmaceutical range by far. Nonetheless, these pharmaceuticals can serve as guide substances when investigating the pharmaceutical burden in the South Baltic Sea. It should be emphasised that there might be uncertainties and deviations in the results.

Pharmaceutical	Germany	Sweden	Poland	Lithuania
	[mg/inh.]	[mg/inh.]	[mg/inh.]	[mg/inh.]
Amoxicillin	840.9	414.7	2,952.9	977.3
Atenolol	51.8	262.8	19.3	4.2
Azithromycin	82.0	9.8	73.0	7.6
Bezafibrate	163.4	31.4		
Carbamazepine	892.7	526.6	715.9	204.1
Ciprofloxacin	365.1	298.6	251.0	84.5
Clarithromycin	205.8	13.4	226.7	66.4
Diclofenac	616.2	334.4	210.1	257.7
Erythromycin	350.3	50.1		0.9
Estradiol	3.3		0.8	
Ethinylestradiol	5.4			
Fluoxetine	11.4	46.0	20.0	2.3
Ibuprofen	12,610.4	10,585.6	223.6	2,001.6
Iopromide	19,551.7			
Metformin	29,621.5	15,459.0	17,602.7	9,606.2
Metoprolol	1,796.1	1,441.2	82.2	618.7
Naproxen	261.4	1,108.6	780.4	135.4
Oxazepam	1.0	69.6		1.4
Paracetamol	882.9	58,416.1		968.6
Propranolol	87.7	76.7	27.6	4.3
Risperidone	3.0	1.4	1.2	1.2
Sulfamethoxazole	260.9	238.2	149.6	47.3

Comparison of relation between various distribution sites of pharmaceuticals in Sweden and Germany



For Swedish and German data, a comparison of different distributing sites of pharmaceuticals was possible. This included prescriptions, hospitals and over the counter sales (OTC).

Overall, a relatively low contribution from hospitals was investigated for 15 pharmaceuticals. The antibiotic Ciprofloxacin is exceptionally often applied in hospitals but still mainly distributed by pharmacies/prescriptions in both countries.

Hence, a removal of pharmaceuticals only from hospital wastewater is not sufficient. Decreasing antibiotic resistances requires action at municipal WWTPs due to outpatient intake.

In general, painkillers are largely consumed via OTC, such as Ibuprofen. This means that a reduction of loads and resulting burden to the environment is also strongly caused by excessive individual application of pharmaceuticals.

This policy brief was developed in the MORPHEUS project. The results are based on Deliverable 3.1: Pharmaceutical consumption patterns in four coastal regions of the South Baltic Sea.