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## Background

To monitor outpatient antibiotic consumption in Europe many different measures have been reported (e.g. Defined Daily Doses (DDD), prescriptions, packages, individuals) and trends over time depend on the measure used<sup>1</sup>. This is explained by changes in the number of DDD per package. This number significantly increased over time (2002-2007) for 24 European countries, significantly decreased for Ireland and the UK, and remained unchanged for Slovenia and Croatia<sup>1,2</sup>. Yet, more and more countries are setting different national targets for outpatient antibiotic consumption using different measures. European countries have their own regulations for antibiotics. We hypothesise that these determine the most appropriate measure to monitor national antibiotic consumption. We aimed to get insight in current antibiotic regulatory prescribing processes in Europe in order to better understand what measure is most appropriate to monitor national volumes of outpatient antibiotic consumption.

## Methods

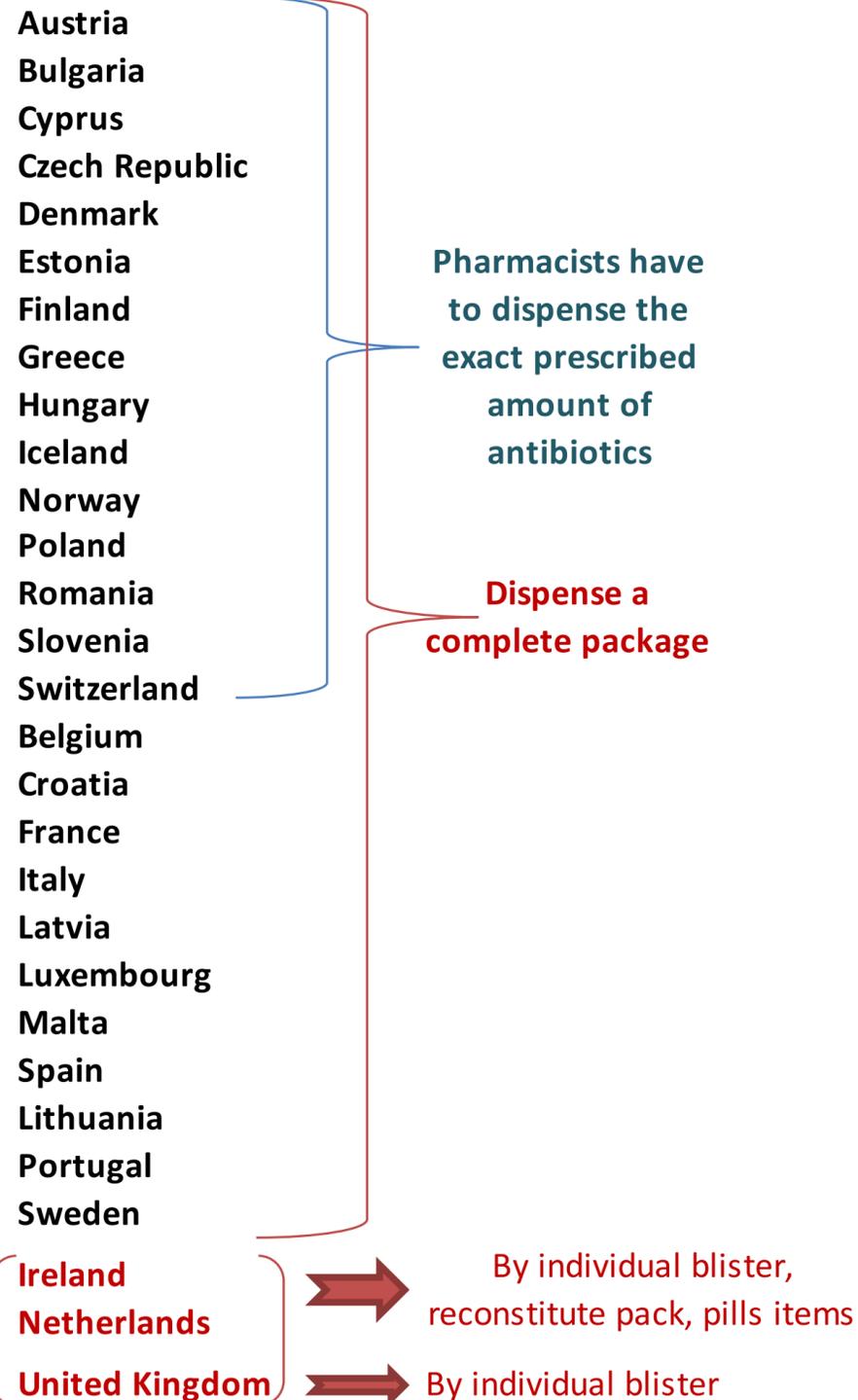
In 2015, representatives of 28 European countries and 2 European Free trade Association countries were invited to complete a questionnaire on the regularization of antibiotics, in collaboration with the ARNA-project (Antimicrobial Resistance and causes of Non-prudent use of Antibiotics in human medicine; [www.nivel.nl/en/arna](http://www.nivel.nl/en/arna)).

The questionnaire (35 questions) collected, amongst other, information regarding:

- 1) Legal provisions for the prescription,
- 2) Reimbursement status of antibiotics,
- 3) Good distribution practice in ambulatory care.

The two main questions of interest for this study were :

1. Pharmacists have to dispense the 'exact prescribed amount' of antibiotic pharmaceutical forms (pills, tablets, vials or other)? Exact amount refers to prescribed package size, prescribed number of packages and/or prescribed dosage strength.
2. Can pharmacists dispense incomplete packages of antibiotics in your country?



**Figure. Overview of European countries dispensing complete antibiotic packages**  
Slovakia and Germany not validated

## Results

Representatives of 27 European countries, Iceland and Norway responded. In 26 countries (90%) antibiotics are dispensed as complete packages. In 15 of those the exact prescribed package is dispensed (prescription most probably adjusted to pack-size) (**Figure**).

In other countries, less antibiotics can be dispensed (e.g. Italy), the nearest pack size (Malta) or margins are set (Denmark). In Norway, an incomplete package can be dispensed, but at increased cost.

In Portugal, Lithuania, Slovakia and Sweden, pharmacists may dispense by individual blister in very exceptional cases only, allowing pharmacists to open a package.

## Conclusions

Community pharmacists in all EU countries dispense complete packages of antibiotics, except in the UK, Ireland and the Netherlands.

In countries where complete packages are sold (90% of EU countries), and where the number of units per package and/or the amount of active substance per unit significantly increased over time (24 EU countries), **DDDs alone** are not a reliable measure to monitor outpatient antibiotic use. Therefore, in those countries, DDDs alone should not be used to monitor national antibiotic consumption, to set targets, to assess the impact of awareness campaigns, or to study the link with antibiotic resistance.

Our survey supports the current policy of the European Centre for Disease Prevention and Control's ESAC-Net project to report outpatient antibiotic consumption in both DDDs and packages.

## References

- (1) Bruyndockx et al. Measuring trends of outpatient antibiotic use in Europe: jointly modelling longitudinal data in DDD and packages. *J Antimicrob Chemother* 2014;69:1981-1986.
- (2) Coenen et al. Comment on : Measurement units for antibiotic consumption in outpatients. *JAC* 2014;69:1981-1986.