

Materials and methods

Surveillance of antibiotic use in humans

Data on the consumption of antibiotics were collected by a pre-established protocol, using the ATC/DDD classification that is developed by WHO Collaborating Centre for Drug Statistics Methodology (<http://www.whocc.no>). The Defined Daily Dose is the assumed average maintenance dose per day for a drug used for its main indication in adults. The DDD is a unit of measurement and does not necessarily reflect the recommended or prescribed daily dose. It enables however comparison of drug consumption statistics at international and other levels (reference 1). The 2011 update of the ATC/DDD classification system is used to calculate the number of DDDs in this report.

Primary health care

All antibiotics for human use are prescription-only medicines in the Netherlands. The majority of antibiotics are delivered to patients by community pharmacies. Direct delivery of medicines by general practitioners from their own pharmacy reaches approximately 8.4% of the Dutch population, mainly in rural areas (reference 2).

Data on the use of antibiotics in primary health care were obtained from the Foundation for Pharmaceutical Statistics (SFK; <http://www.sfk.nl>) and expressed as the number of Defined Daily Doses (DDD) per 1000 inhabitants per day.

Sales data from approximately 90% of all community pharmacies are transferred monthly to SFK in an electronically format. The data are subsequently weighted statistically and extrapolated to cover 100% of the deliveries by community pharmacies. The total number of DDDs is divided by the total number of inhabitants that is registered by a community pharmacy (approximately 91.6% of the total number of inhabitants in the Netherlands). Data on the number of inhabitants in the Netherlands are obtained from Statistics Netherlands (CBS; <http://www.cbs.nl>).

SFK data on antibiotic use do not include the use of antibiotics in hospitals. Antibiotics prescribed by hospital based medical specialists to their outpatients are however included. Deliveries from community pharmacies to nursing-homes as an institute are not covered.

Note that when the term antibiotic 'use' is used, this actually refers to antibiotic 'prescription' by general practitioners. Although these two measurements are almost equal, actual 'use' is a bit lower than 'prescription', caused by patients not collecting their prescription, or not (completely) using their medication.

Hospitals

Data on the use of antibiotics in Dutch hospitals were collected by the SWAB by means of a questionnaire distributed to all Dutch hospital pharmacists. The number of admissions and the number of days spent in the hospital (bed-days) are also registered in the questionnaire. The use of antibiotics is expressed as DDD/100 patient-days and in DDD/100 admissions (reference 3). The number of patient-days is calculated by subtracting the number of admissions from the number of bed-days to compensate for the fact that in the bed-days statistics both the day of admission and the day of discharge are counted as full days.

Note that when the term antibiotic 'use' is used, this actually refers to 'sales' or 'purchase' data provided by hospital pharmacies, instead of data on real drug administration to the hospital patients.

¹ Natsch S, Hekster YA, de Jong R, Heerdink ER, Herings RM, van der Meer JW. Application of the ATC/DDD methodology to monitor antibiotic drug use. *Eur J Clin Microbiol Infect Dis*. 1998;17:20-4.

² Batenburg-Eddes T van, Berg Jeths A van den, Veen AA van der, Verheij RA, Neeling AJ de. Regional variations in use of pharmaceuticals. National Institute of Public health and the Environment. Bilthoven (the Netherlands), 2002. ISBN 90 6960 099 4.
<http://www.rivm.nl/bibliotheek/rapporten/270556005.html>

³ Filius PMG, Liem TBY, van der Linden PD, Janknegt R, Natsch S, Vulto AG and HA Verbrugh. An additional measure for quantifying antibiotic use in hospitals. *J Antimicrob Chemother*. 2005;55:805-808.