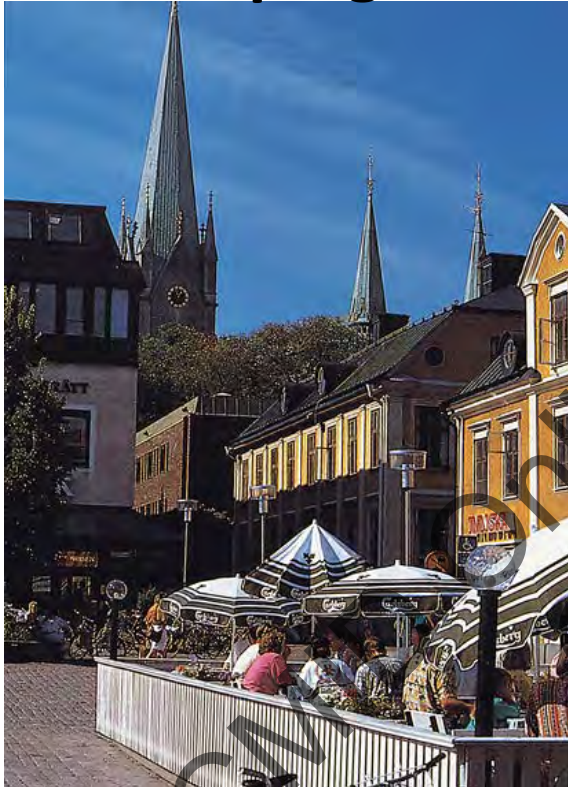




Linköping University, Sweden

One university – two cities

Linköping



Norrköping



Håkan Hanberger, MD, PhD, Professor

Div of Infectious Diseases, Faculty of Health Sciences, Linköping University
Swedish Reference Group of Antibiotics and Strama, Swedish Institute for Infectious Disease Control

How to measure antimicrobial consumption

ESCMID Postgraduate Education Course
Antimicrobial Stewardship Measuring, Auditing and Improving

ESGAP
BSAC
London 2012

Håkan Hanberger, MD, PhD, Professor

Div of Infectious Diseases, Faculty of Health Sciences, Linköping University
Swedish Reference Group of Antibiotics and Strama, Swedish Institute for Infectious Disease Control

How to measure antimicrobial consumption

National level

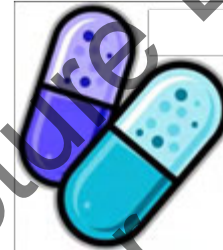
- Outpatients (all)
- Hospitals (all)

Local level

- Outpatient: Primary care centre
- Hospital: wards

Patient level

- Outpatients per indication: UTI, pneumonia etc
- Hospital patients per indication: Ventilator associated pneumonia, CRBI etc



Definition of Defined Daily Dose (DDD):



DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults.

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DDD per 1000 inhabitants per day

Antibiotic Consumption in EU - Outpatients

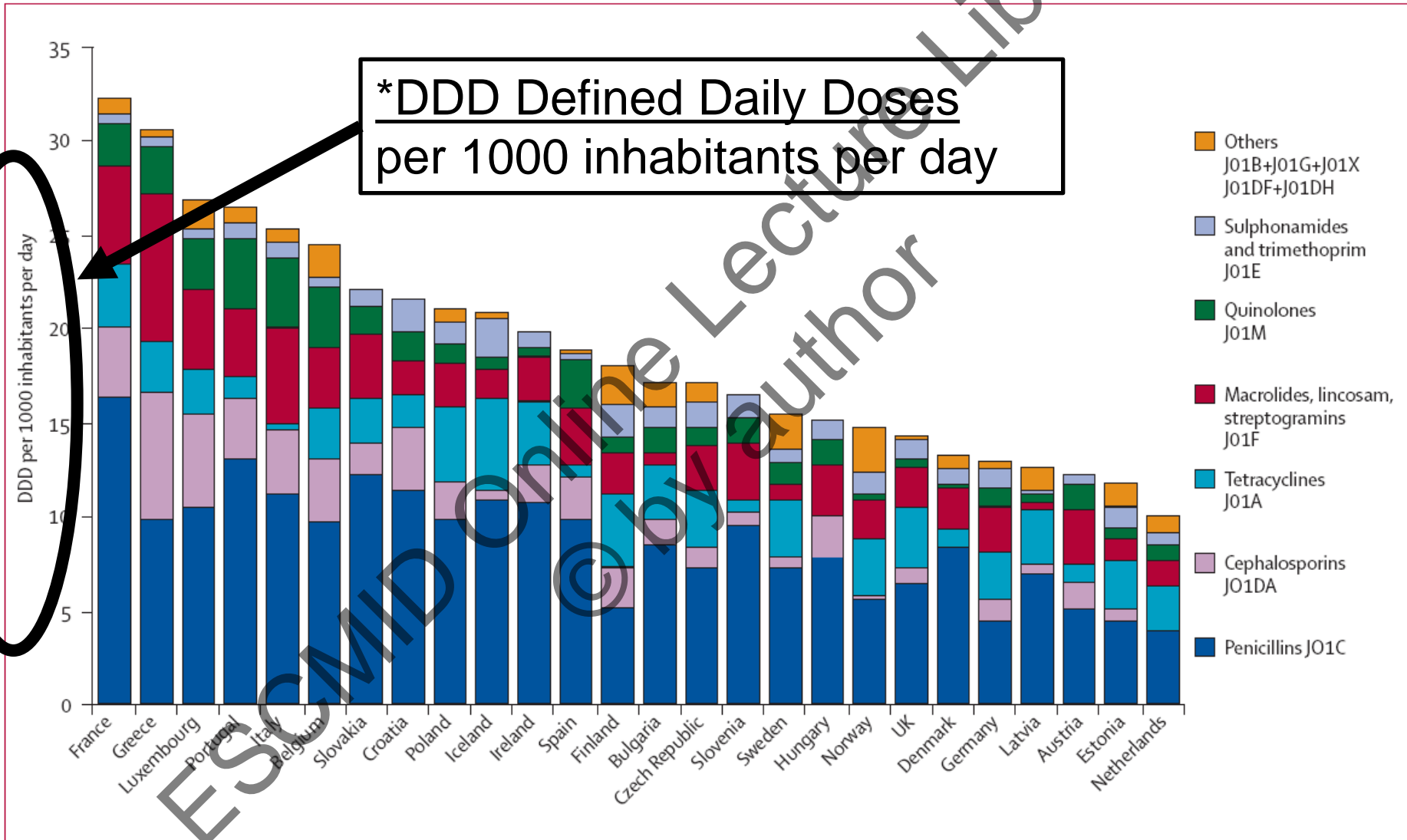


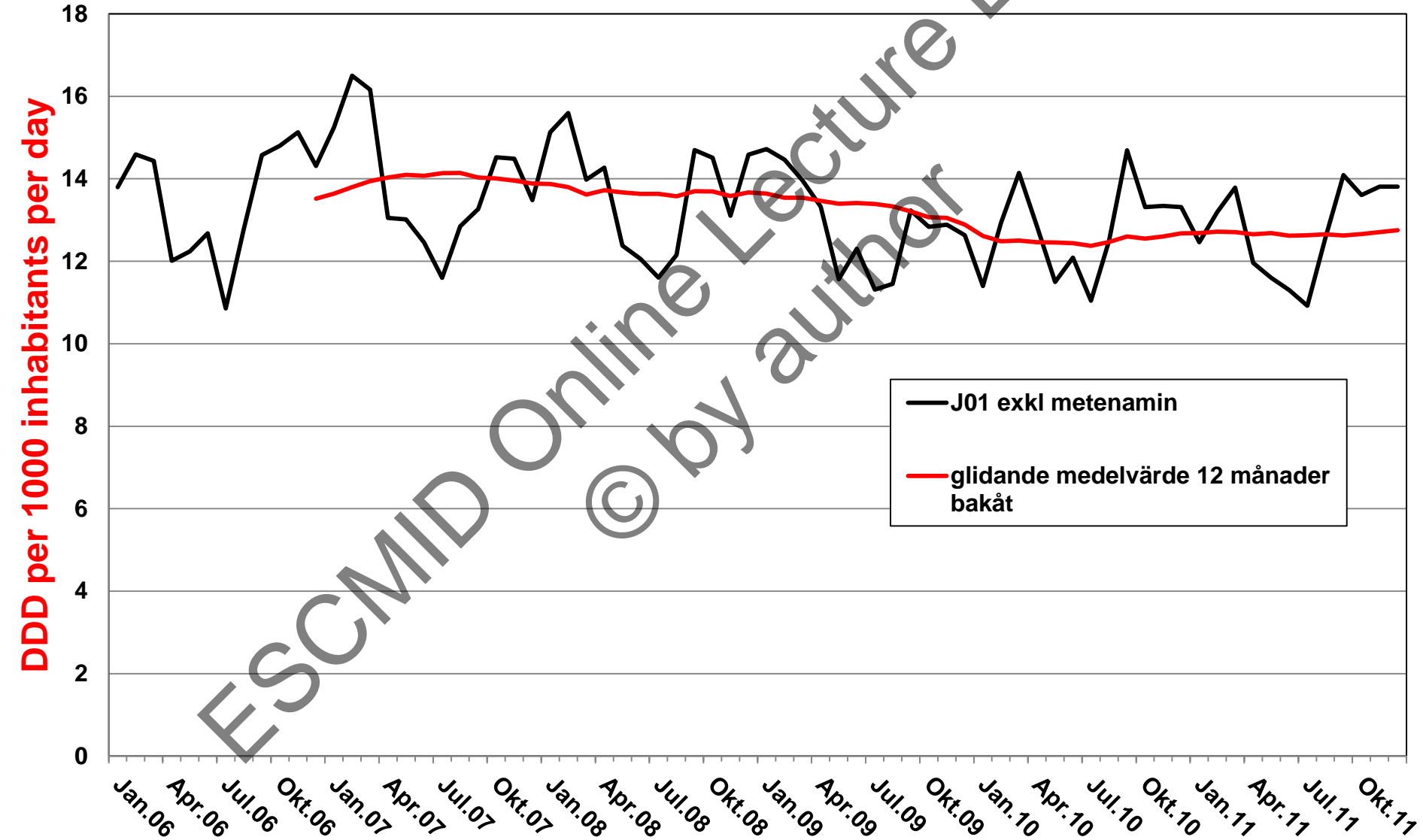
Figure 1: Total outpatient antibiotic use in 26 European countries in 2002

DDD per 1000 inhabitants per day

Outpatients – National Level

Antibiotics consumption in Sweden, 2006-2011

Source *Apotekens Service AB, Concise*

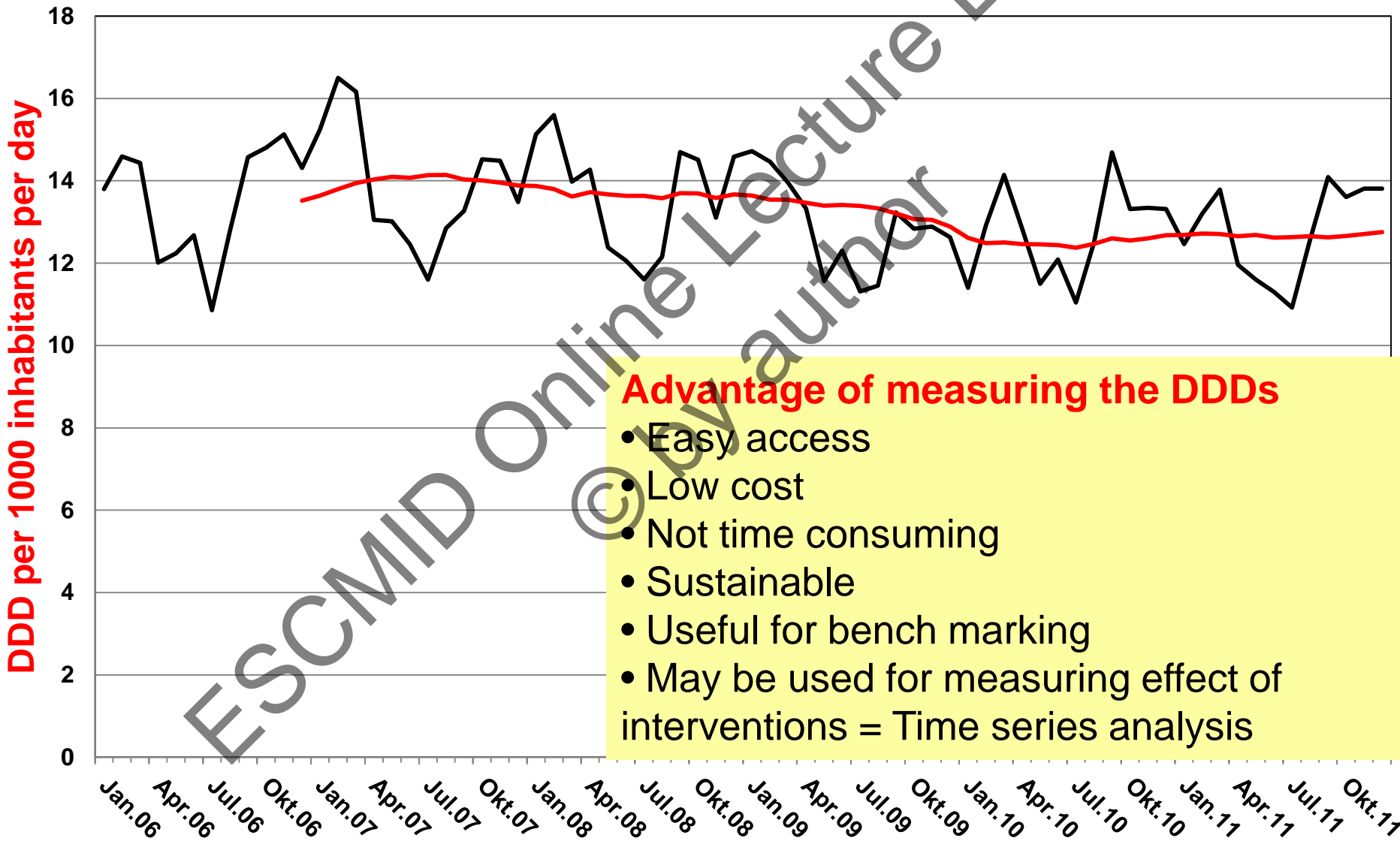


DDD per 1000 inhabitants per day

Outpatients – National Level

Antibiotics consumption in Sweden, 2006-2011

Source *Apotekens Service AB, Concise*



Advantage of measuring the DDDs

- Easy access
- Low cost
- Not time consuming
- Sustainable
- Useful for bench marking
- May be used for measuring effect of interventions = Time series analysis



Guided Tour DDD

on

http://www.whooc.no/atc_ddd_index

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The basic **definition** of the defined daily dose (DDD) is:

The DDD is the assumed average maintenance dose per day for a drug used for its main indication in adults.

- A DDD will only be assigned for drugs that already have an ATC code.
- It should be emphasised that the defined daily dose is a unit of measurement and does not necessarily reflect the recommended or prescribed Daily Dose. Doses for individual patients and patient groups will often differ from the DDD and will necessarily have to be based on individual characteristics (e.g. age and weight) and pharmacokinetic considerations.
- For the optimal use of drugs, it is important to recognise that genetic polymorphism due to ethnic differences can result in variations in pharmacokinetics of drugs. The DDD should reflect the global dosage irrespective of genetic variations of drug metabolism.
- Drug consumption data presented in DDDs only give a rough estimate of consumption and not an exact picture of actual use. The DDD provide a fixed unit of measurement independent of price and dosage form (e.g. tablet strength) enabling the researcher to assess trends in drug consumption and to perform comparisons between population groups.





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Anatomical Therapeutic Chemical (ATC) classification for medicines

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- News
- ATC/DDD Index**
- Updates included in the ATC/DDD Index
- ATC/DDD methodology
- ATC
- DDD
- ATC/DDD alterations, cumulative lists
- ATC/DDD publications
- Use of ATC/DDD
- Courses
- Meetings/open session
- Deadlines
- Links

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- J **ANTIINFECTIVES FOR SYSTEMIC USE**
- J01 **ANTIBACTERIALS FOR SYSTEMIC USE**
- J01M **QUINOLONE ANTIBACTERIALS**
- J01MA **Fluoroquinolones**

ATC code	Name	DDD	U	Adm.R	Note
J01MA02	ciprofloxacin	1	g	O	
		0.5	g	P	





[List of abbreviations](#)

Last updated: 2011-12-19

defined daily dose is a unit of measurement and does not necessarily reflect the recommended or Prescribed Daily Dose.

Postal address:
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Drug Statistics Methodology
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Visiting/delivery address:
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0473 Oslo
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Tel:  +47 21 07 81 60 
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News

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defined daily dose is a unit of measurement and does not necessarily reflect the recommended or Prescribed Daily Dose.

Most common prescribed daily dose
ORAL Tabl. Ciprofloxacin 0.5g x 2
PARENTERAL Inf Ciprofloxacin 0.4g x 2 i.v.

News

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ATC code	Name	DDD	U	Adm.R	Note
J01MA02	ciprofloxacin	1	g	O	
		0.5	g	P	



Be aware of these differences and make corrections if you compare Oral and Parenteral DDDs of Ciprofloxacin

ORAL 1 DDD_{WHO} (1g) = 1 PDD (1g) (prescribed daily dose)

PARENTERAL 1 DDD (0.5g) = 1 PDD (0.8g)

0.8g/0.5g=1.6

1.6 is the "correction factor" to convert DDD to PDD for ciprofloxacin

DDD and Denominators



- Drug consumption figures should preferably be presented as numbers of **DDDs/1000 inhabitants/day**
- or when in-hospital drug use is considered, as **DDDs per 100 bed days**.
- Sales or prescription data presented in DDD/1000 inhabitants/day may provide a rough estimate of the proportion of the population within a defined area treated daily with certain drugs.
 - For example, the figure 10 DDDs/1000 inhabitants/day indicates that 1% of the population on average gets a certain treatment daily.
 - For example, 5 DDDs/inhabitant/year indicates that the consumption is equivalent to the treatment of every inhabitant with a 5 days course during a certain year.
 - Alternatively, if the standard treatment period is known, the total number of DDDs can be calculated as the number of treatment courses, and the number of treatment courses can then be related to the total population.

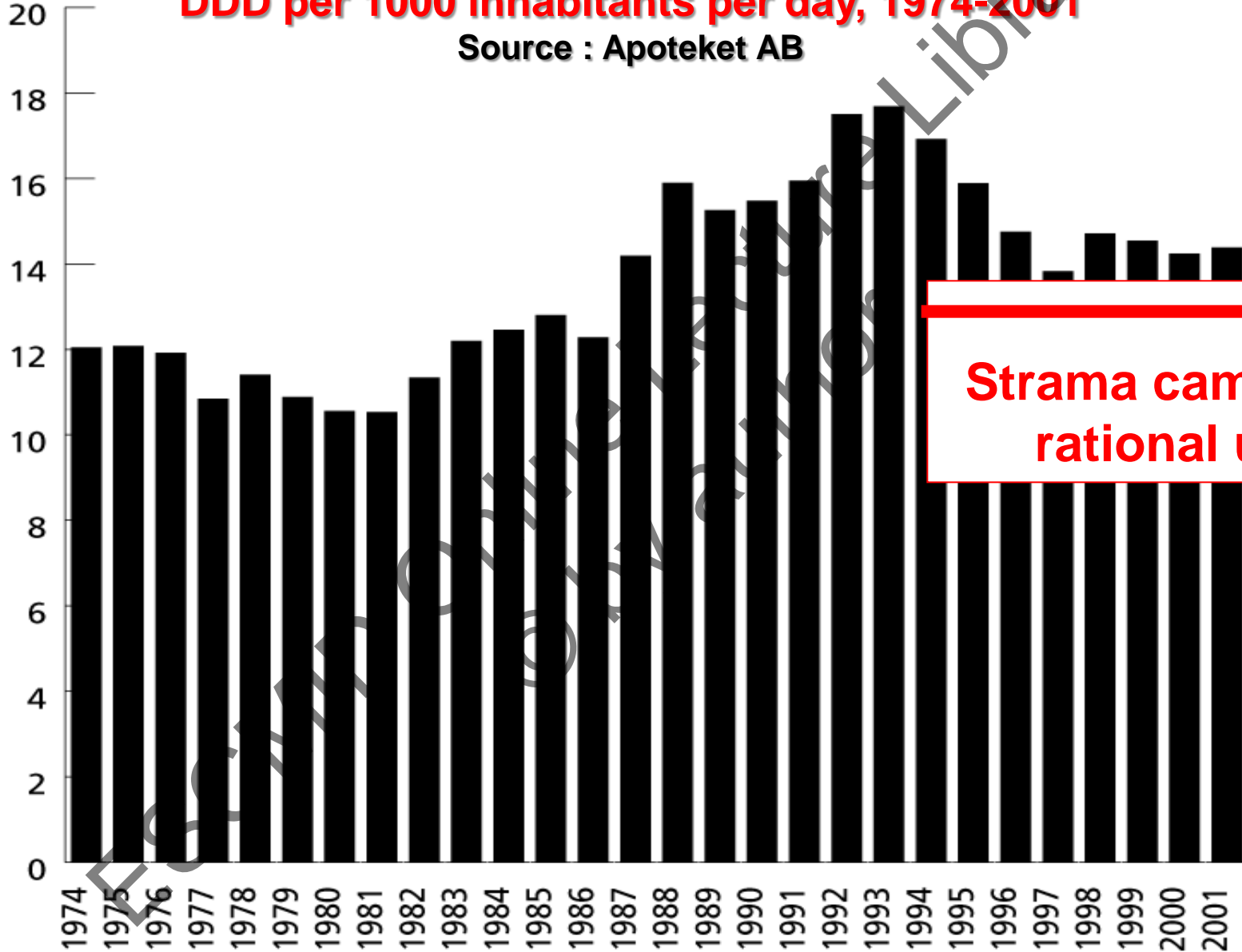
Outpatients – National Level

Antibiotics consumption in Sweden , DDD per 1000 inhabitants per day, 1974-2001

Source : Apoteket AB



DDD per 1000 inhabitants per day



Strama campaign
rational use

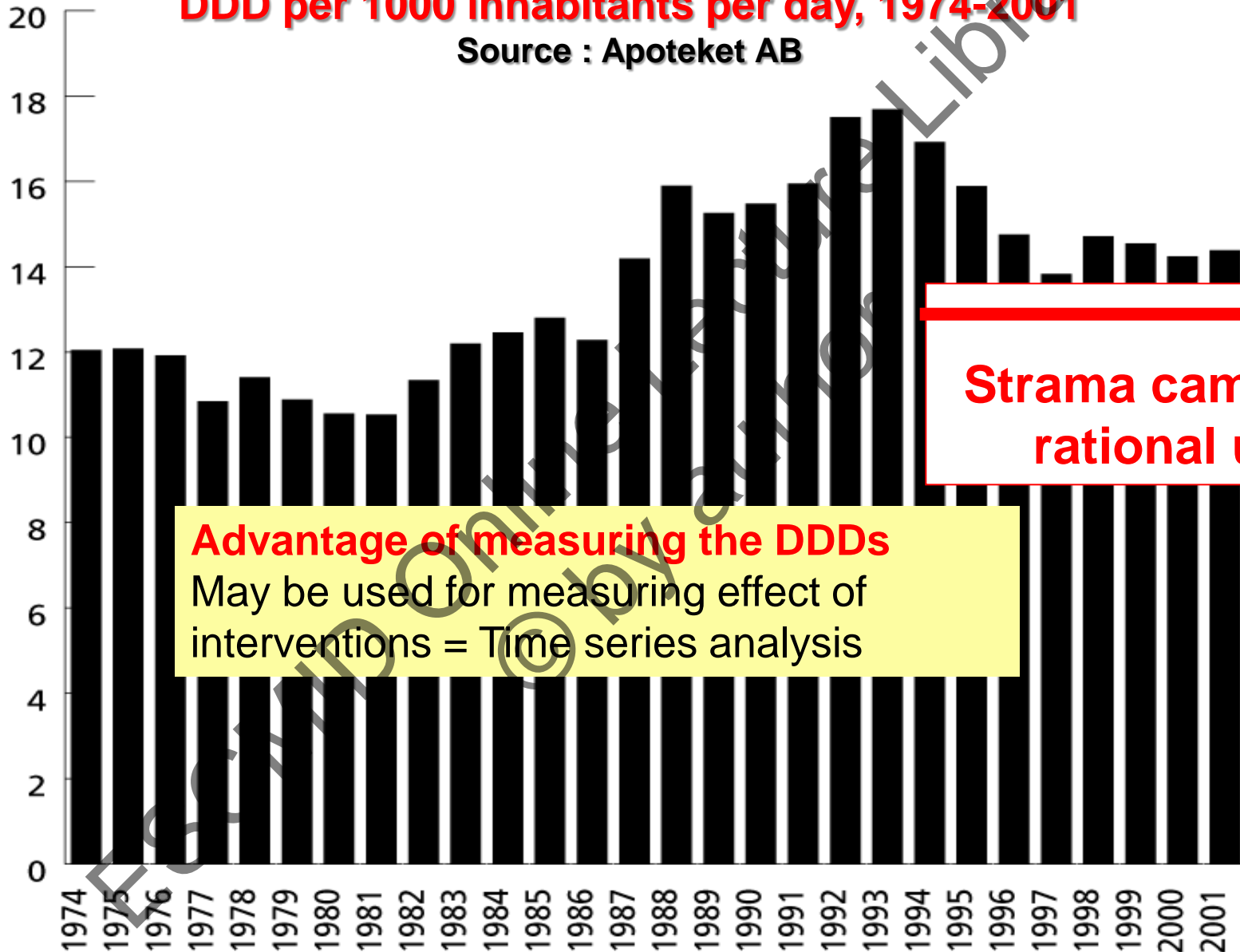
Outpatients – National Level

Antibiotics consumption in Sweden , DDD per 1000 inhabitants per day, 1974-2001

Source : Apoteket AB



DDD per 1000 inhabitants per day



Advantage of measuring the DDDs
May be used for measuring effect of interventions = Time series analysis

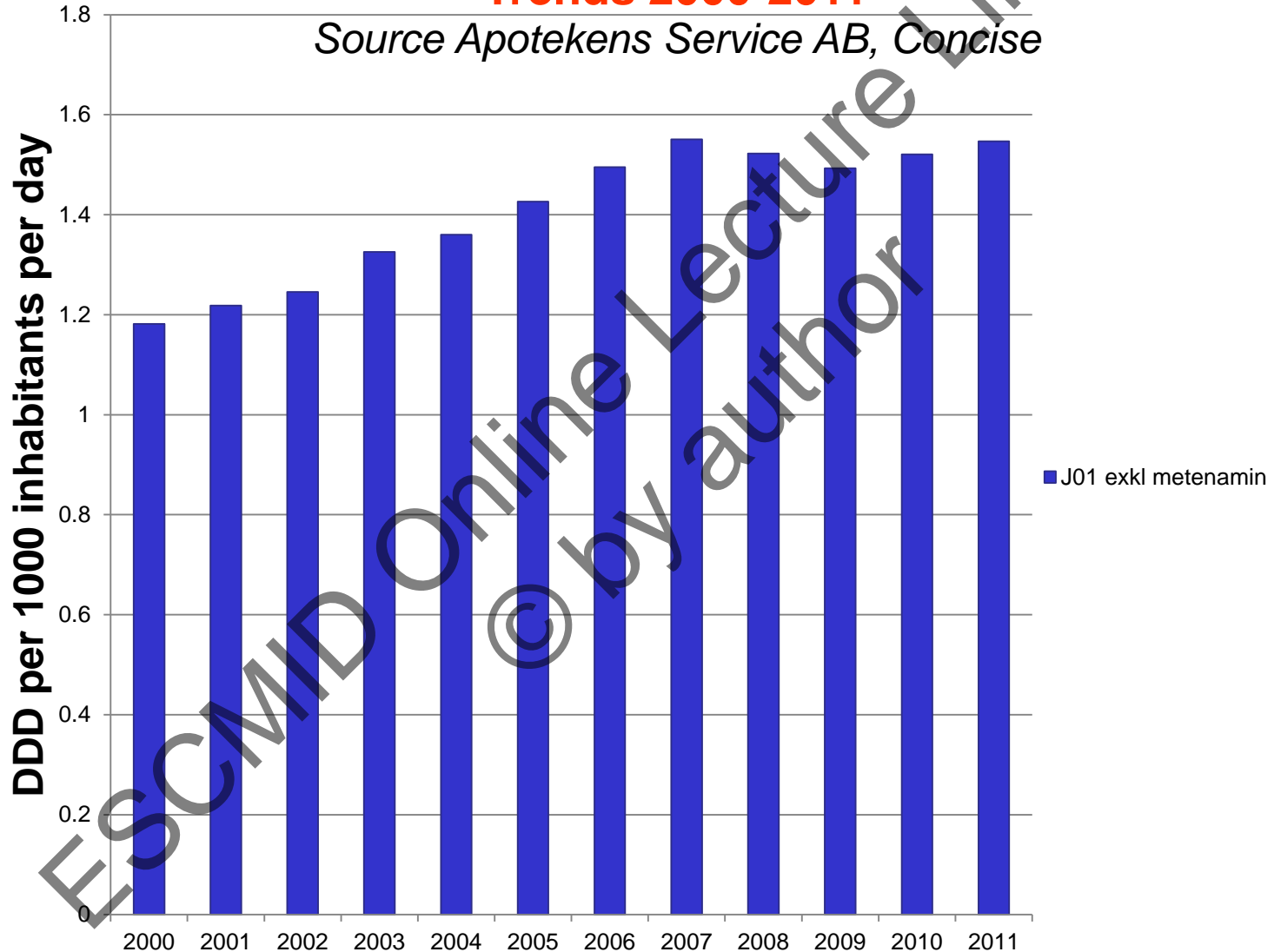
Strama campaign
rational use

HOSPITAL

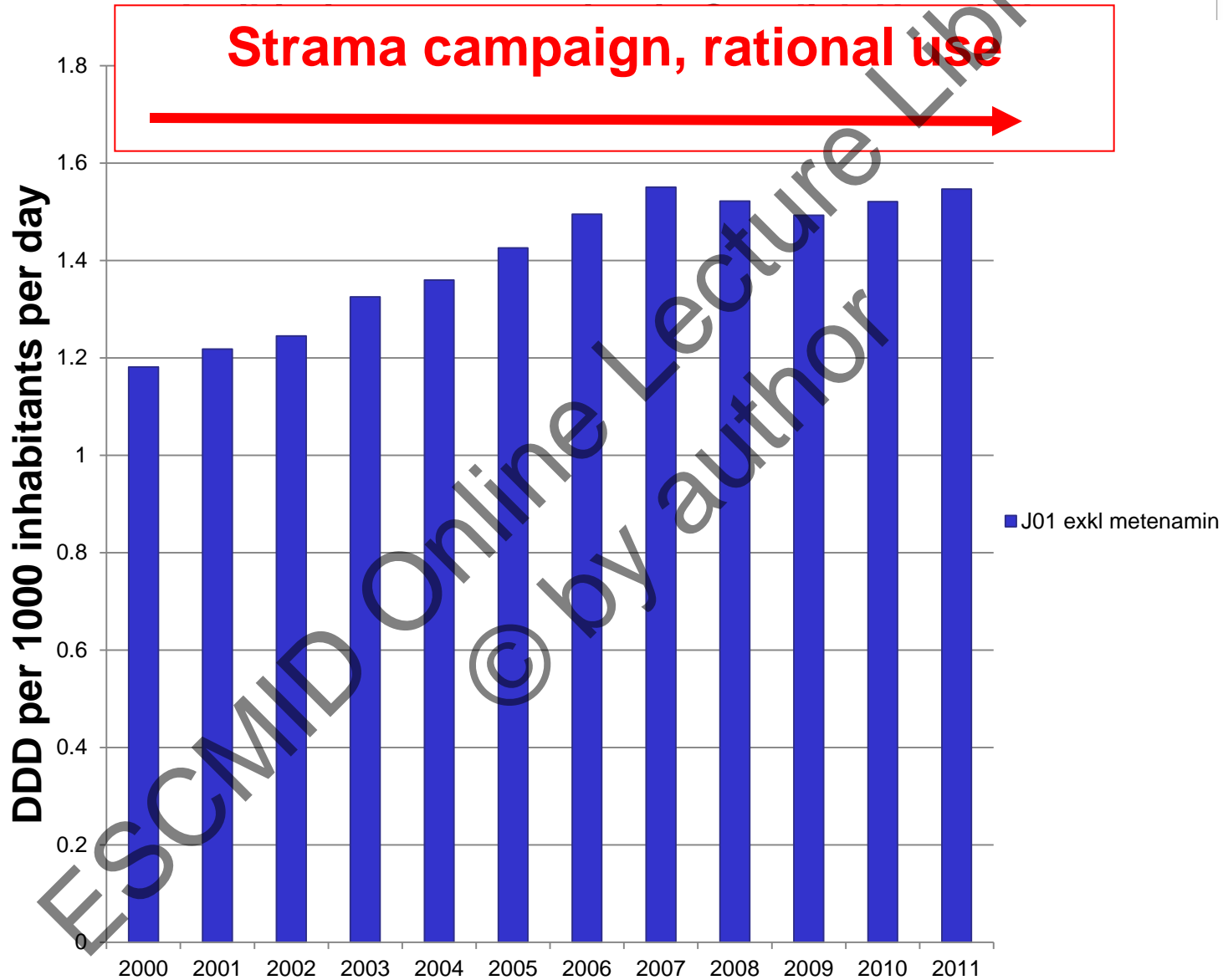
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DDD per 1000 inhabitants per day

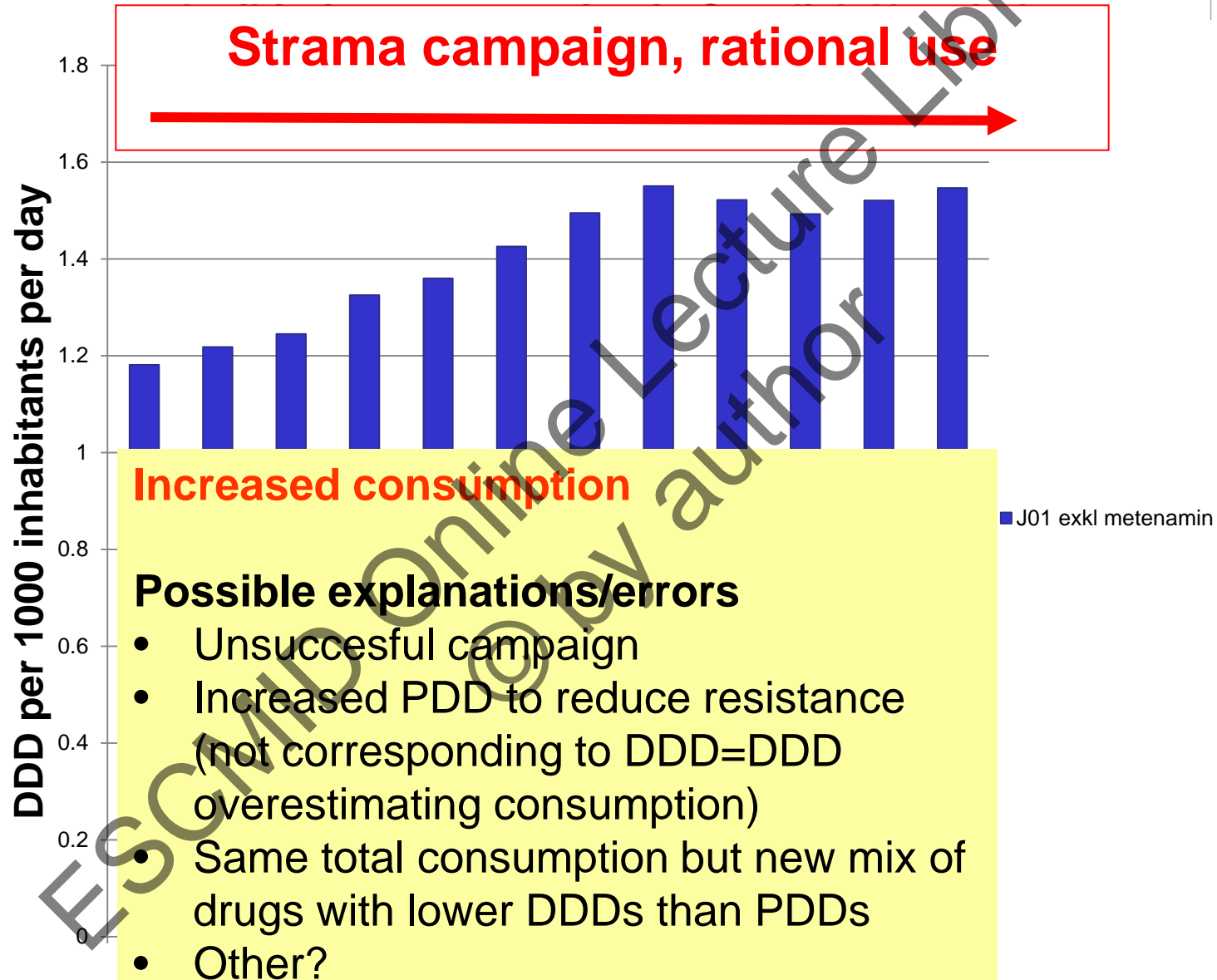
Antibiotic consumption in Swedish Hospitals Trends 2000-2011



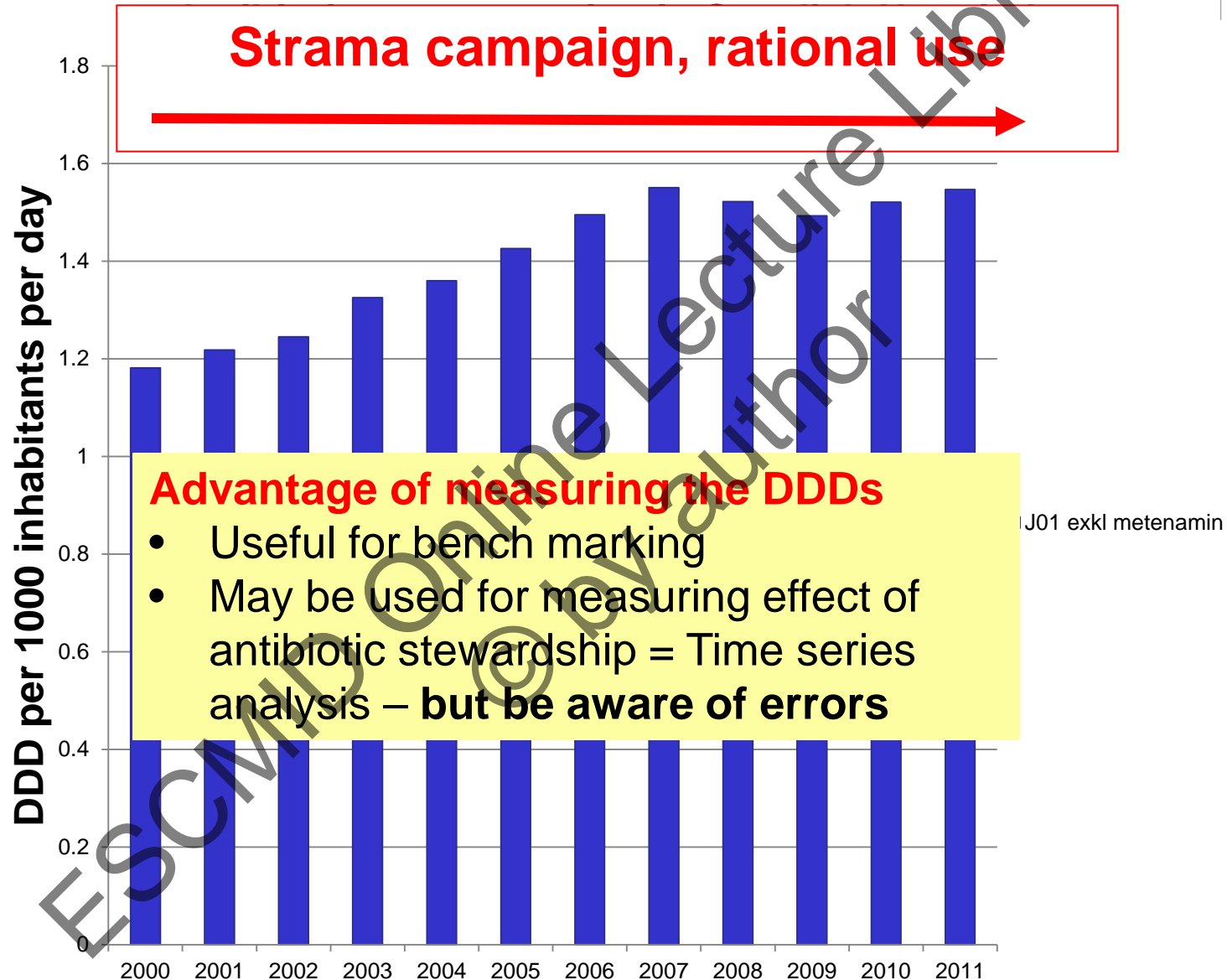
DDD per 1000 inhabitants per day



DDD per 1000 inhabitants per day



DDD per 1000 inhabitants per day



Measures (aggregated data)

- **DDD**, Standardized measurement →
- Dispensations
- Prescribed/ordinated dose, PDD
- Costs

DDD

- **Definition**

- Strict definition
- WHO-center
- Different DDD for p.o. and i.v. products



- **Strengths DDD**

- Aggregates all doses, packages
- Good to follow volume changes with same mix
- Easy access
- Low cost
- Not time consuming
- Sustainable
- Useful for bench marking
- Allow fair comparisons among countries, hospitals and wards
- May be used for measuring effect of interventions = Time series analysis

- **Weaknesses DDD**

- **Administrative unit**
- **Can change over time**
- **Not suitable to follow changes in mix of products/substances/groups**
- *Corrections can be made by WHO*
- **Reported volume distributed not equal to administered dose**
- *In hospitals, it does not allow extrapolation to the number of patient exposed (combinations of antimicrobials)*
- *Total DDDs is strongly influenced by formulary mix*
- Cannot be used in pediatric and neonatal hospitals/wards
- *Does not always correspond to the dose used in routine practice (intensive care, renal failure, prophylaxis)*
- *Does not necessarily correspond to the dose effectively received by the patient...*

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Number of antibiotic dispensations*/**1000**
inhabitants/year

*prescriptions or recipe

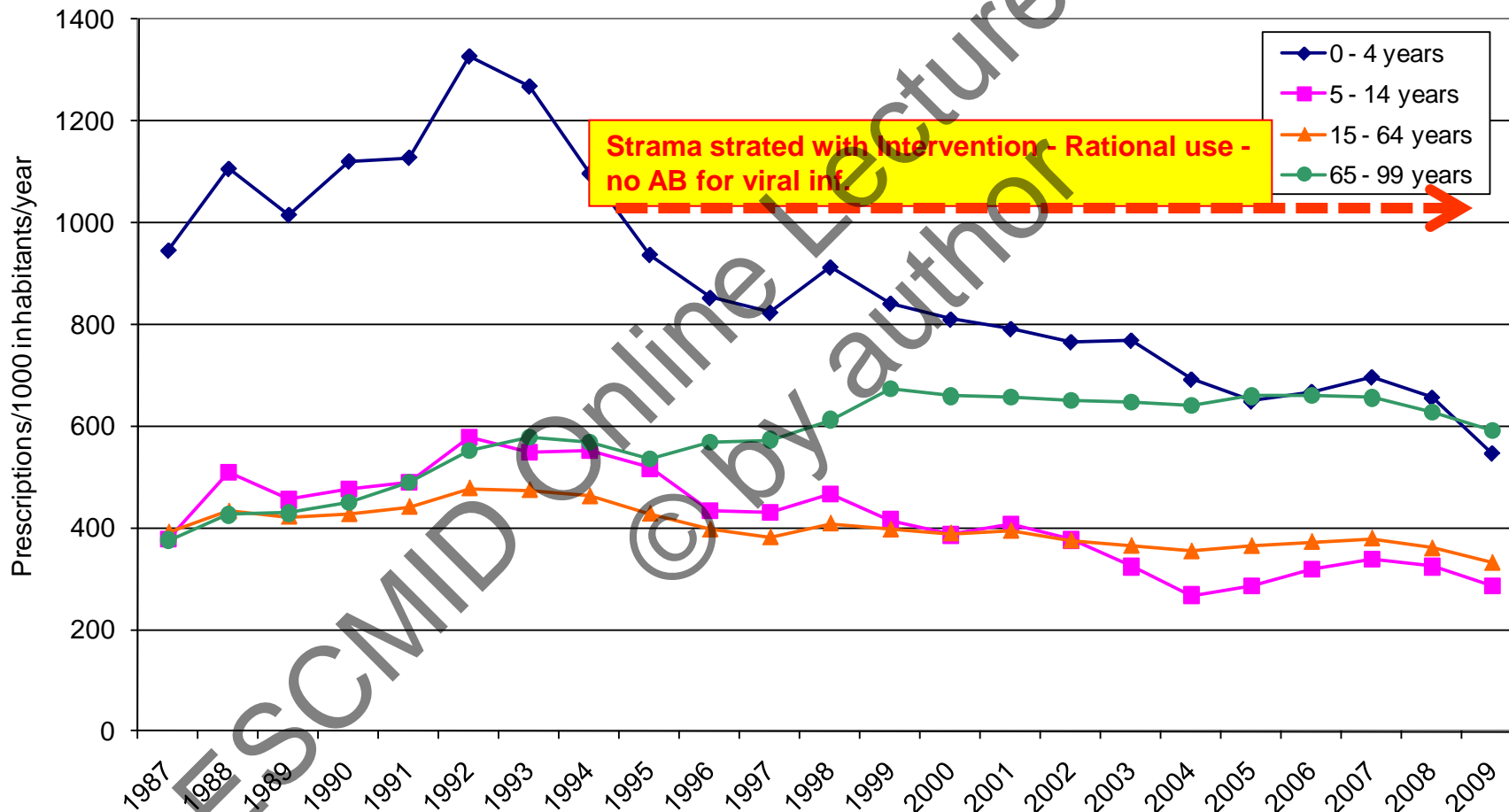
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Number of antibiotic dispensations (= prescriptions or recipe) /1000 inhabitants/year

Antibiotic consumption (J01 exkl methenamine) in different age groups
Community care in Sweden 1987 - 2009, prescriptions per 1000 inhabitants and year

Data source: The National Board of Health and Welfare and The National Corp. of Swedish Pharmacies



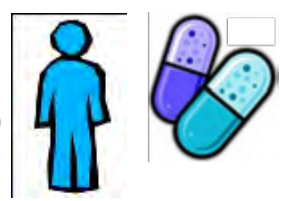
Prescribed daily dose (PDD)

Data source

- Electronic system
- Point Prevalence studies (PPS)
- Charts – retrospectively



Prescribed Daily Doses (PDDs)

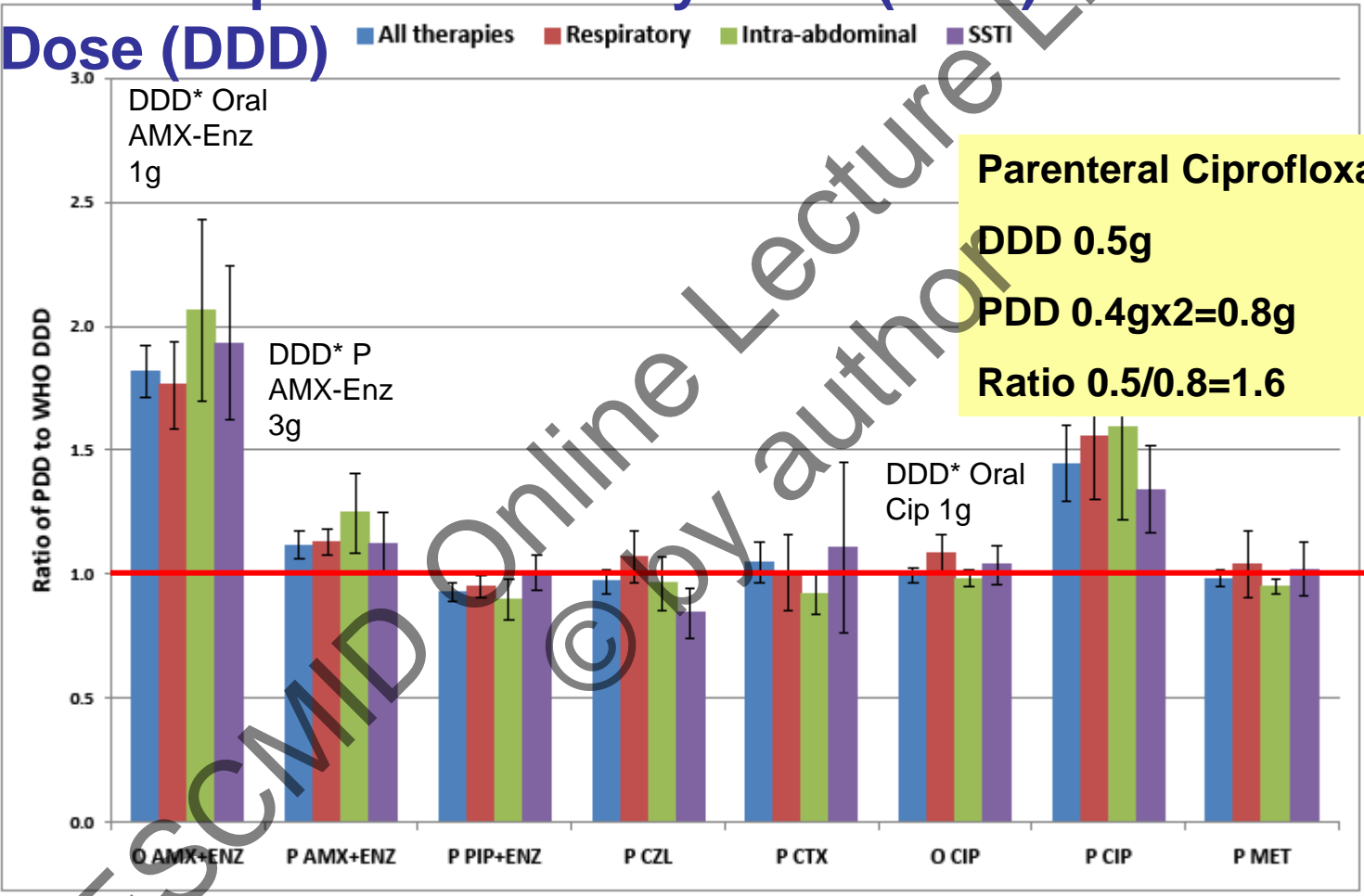


- Defined locally (hospital, ward) or within a group of hospitals
- PDD = average prescribed dose in the main indication (in this hospital, ward or group of hospitals)
- Grams (or I.U.) active substance
- **Do NOT allow inter-hospital comparisons!**

$$\text{No. PDDs} = \frac{\text{No. packages} \times \text{No. tablets per package} \times \text{No. g per tablet}}{\text{PDD of antimicrobial in grams}}$$

The European Surveillance of Antimicrobial Consumption (ESAC) point prevalence survey of antibacterial use in 20 European hospitals in 2006.

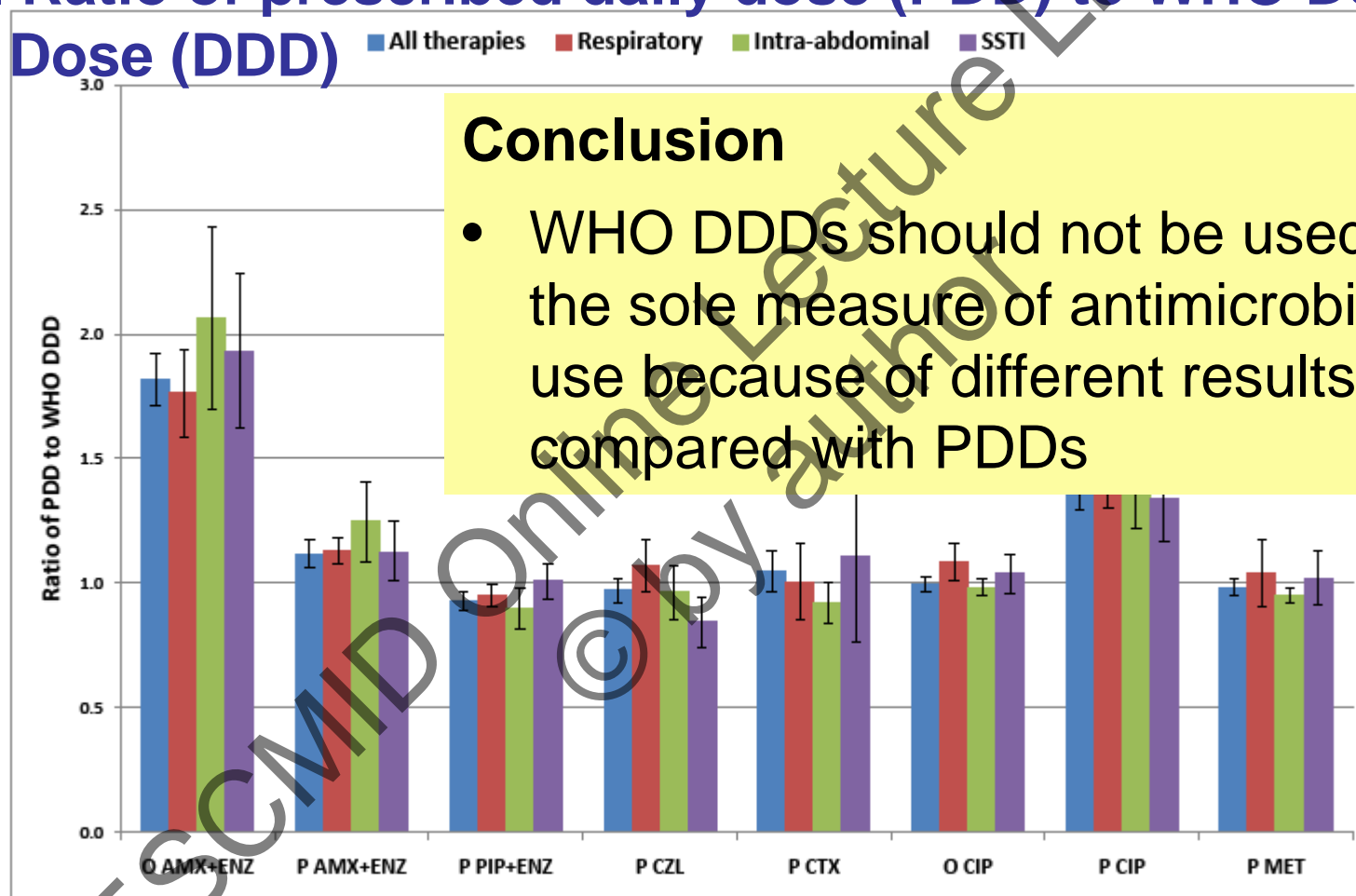
Fig 2. Ratio of prescribed daily dose (PDD) to WHO Defined Daily Dose (DDD)



*DDD Defined Daily Dosages 2006 <http://www.whocc.no/atcddd/>

The European Surveillance of Antimicrobial Consumption (ESAC) point prevalence survey of antibacterial use in 20 European hospitals in 2006.

Fig 2. Ratio of prescribed daily dose (PDD) to WHO Defined Daily Dose (DDD)



How to measure antimicrobial consumption

Patient level



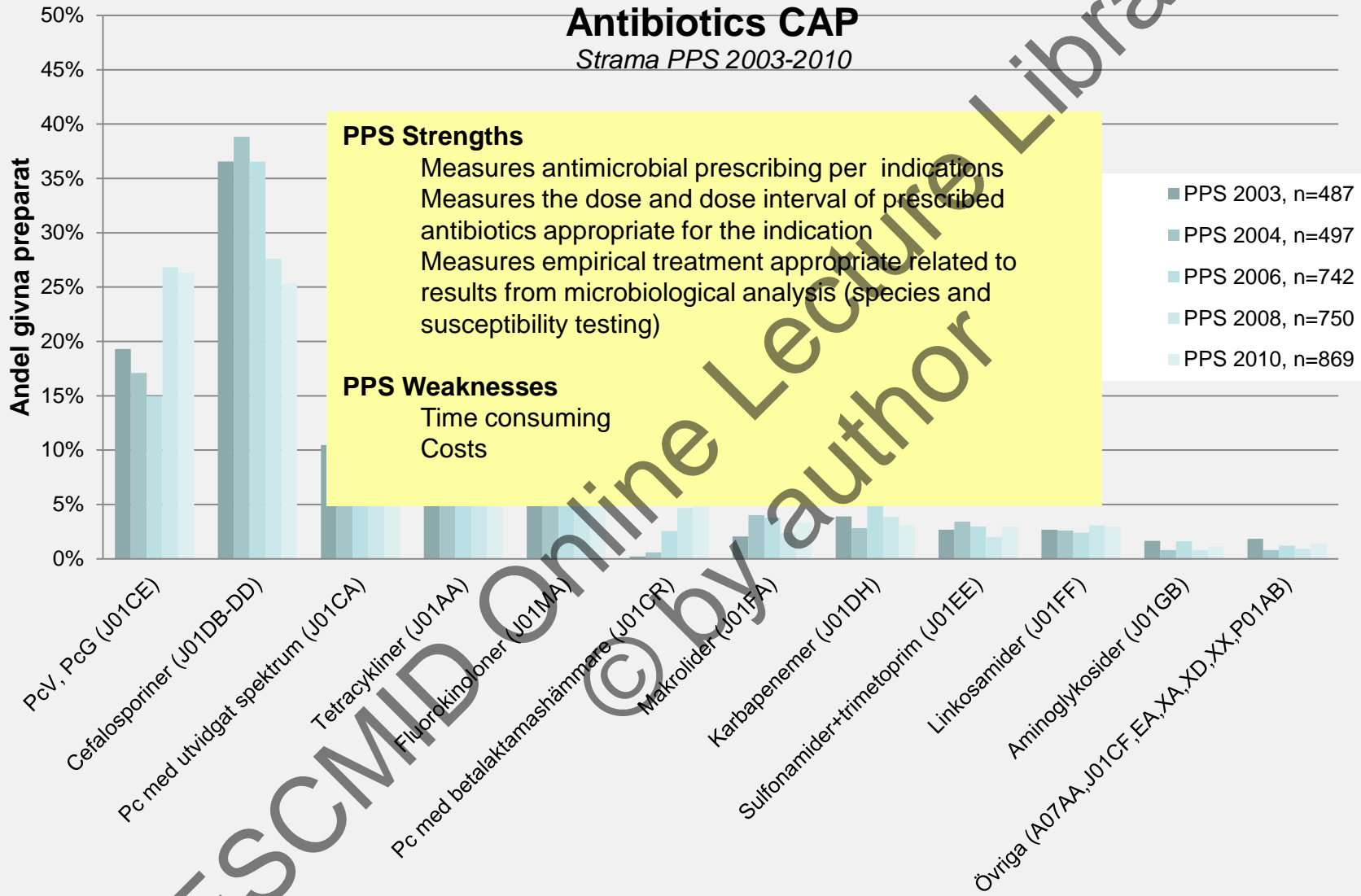
- **Point Prevalence Studies**
examples: ECDC/ESAC, Swedish Strama
- **Electronic patient records**
Outpatients per indication: UTI, pneumonia etc
Hospital patients per indication: Ventilator associated pneumonia, CRBI etc
- **Clinical Studies**

Point Prevalence Studies



Antibiotics CAP

Strama PPS 2003-2010



THANKS

Acknowledgement

- Dominique Monnet ECDC
- Mikael Hoffmann NEPI
- Strama Sweden

Email Hakan.Hanberger@liu.se

The Dalai Lama, when asked what surprised him most about humanity, answered "Man. Because he sacrifices his health in order to make money. Then he sacrifices money to recuperate his health. And then he is so anxious about the future that he does not enjoy the present; the result being that he does not live in the present or the future; he lives as if he is never going to die, and then dies having never really lived."



ESCM