



BCoDE – Burden of Communicable Diseases in Europe

Burden of healthcare-associated infections in Europe

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What is burden of disease?

A common definition:

Disease burden is the **impact** of a health problem

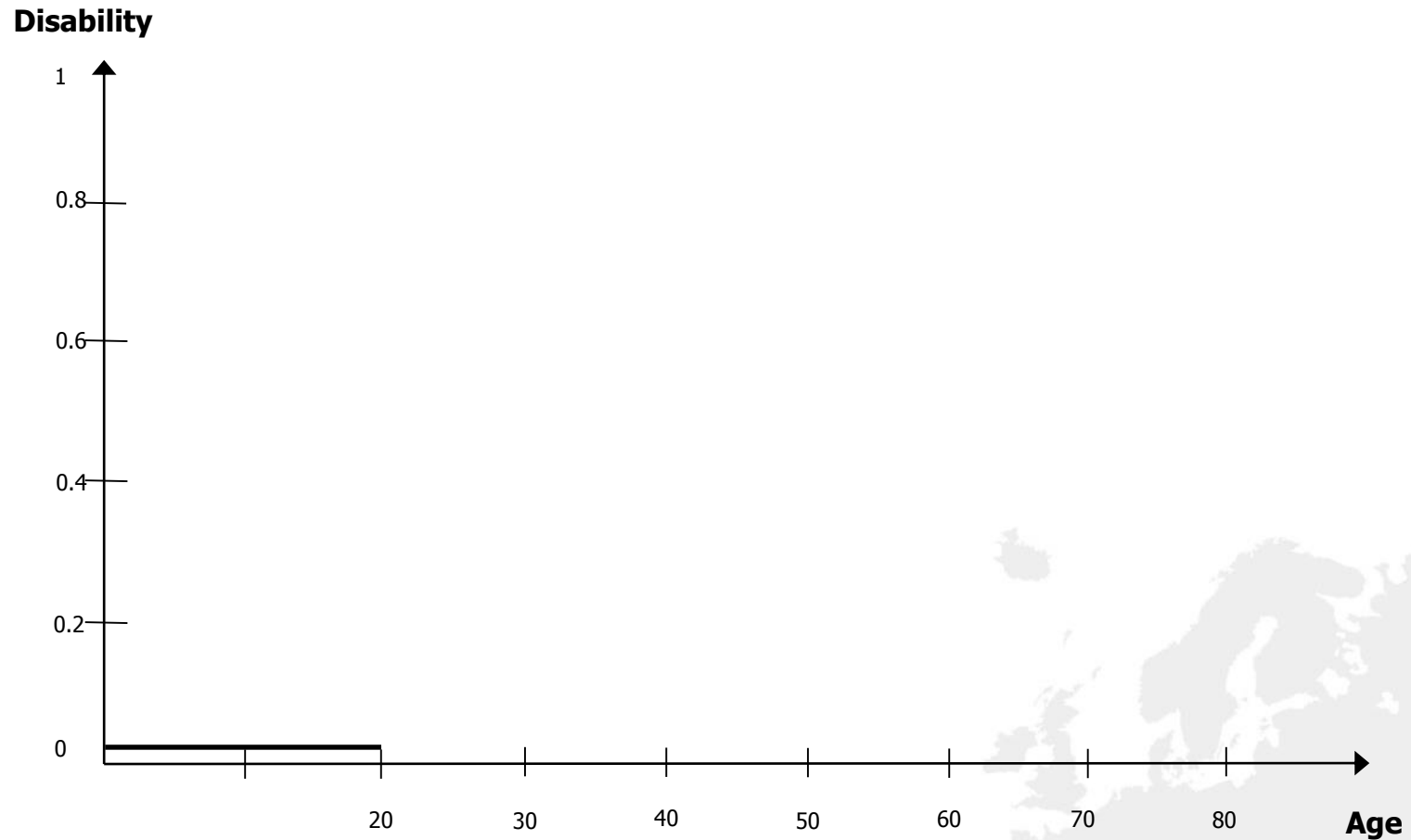
...as measured by financial cost, mortality, morbidity or other indicators.

Choice of a **common currency** in
order to compare impact of diseases
and its sequelae

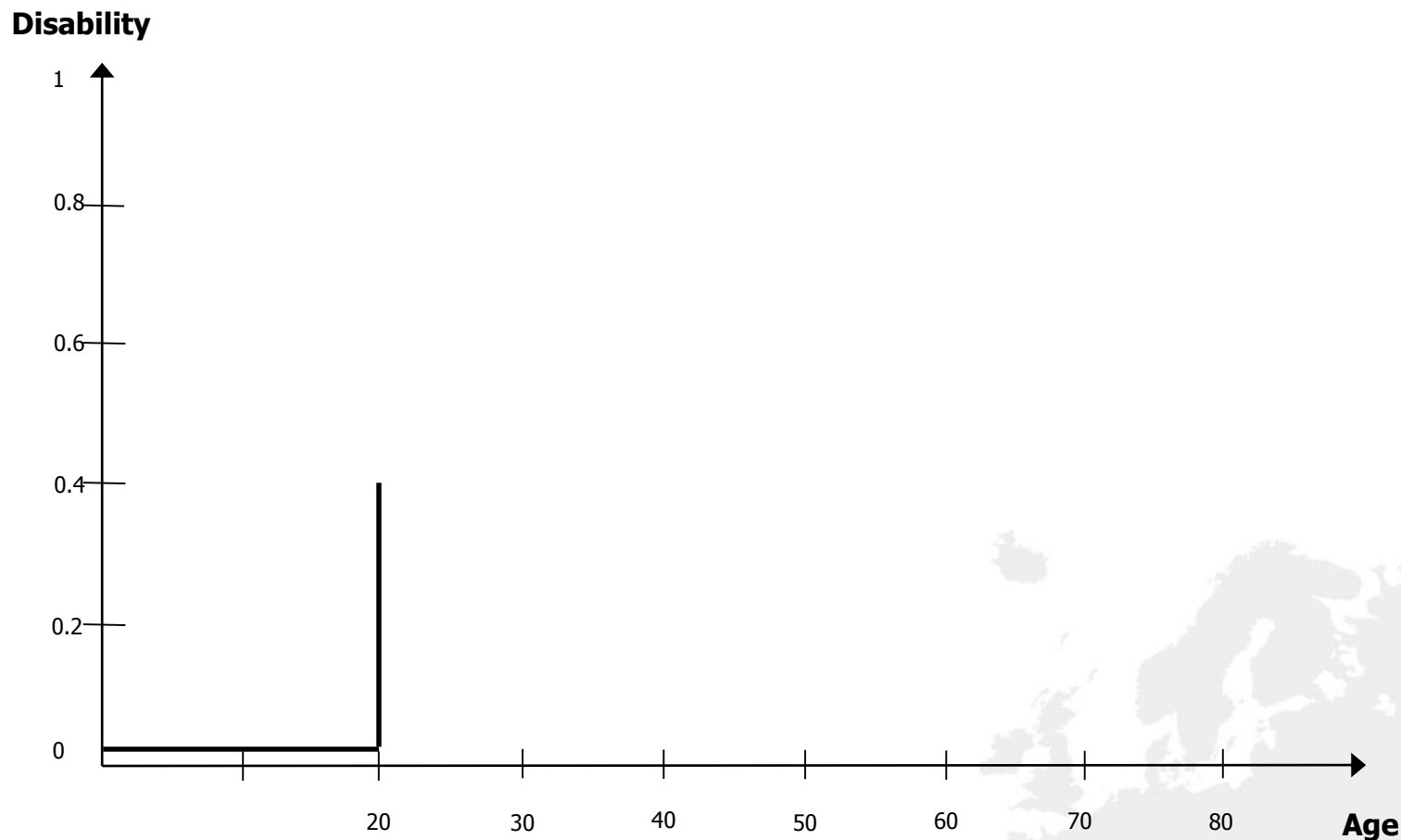


SMPH: summary measure of population health
CHM: composite health measure

Disability-adjusted life years (DALYs)

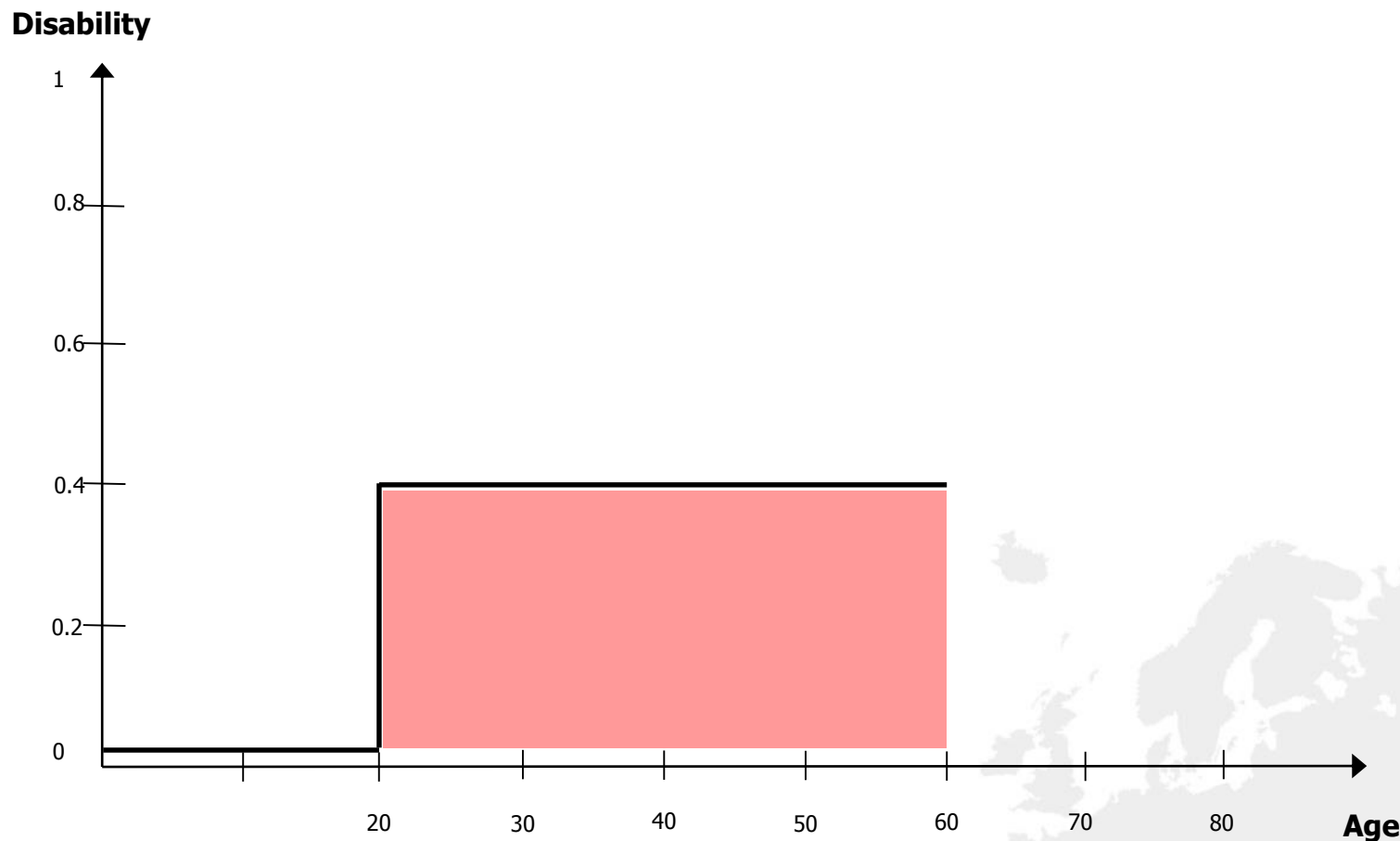


Disability-adjusted life years (DALYs)



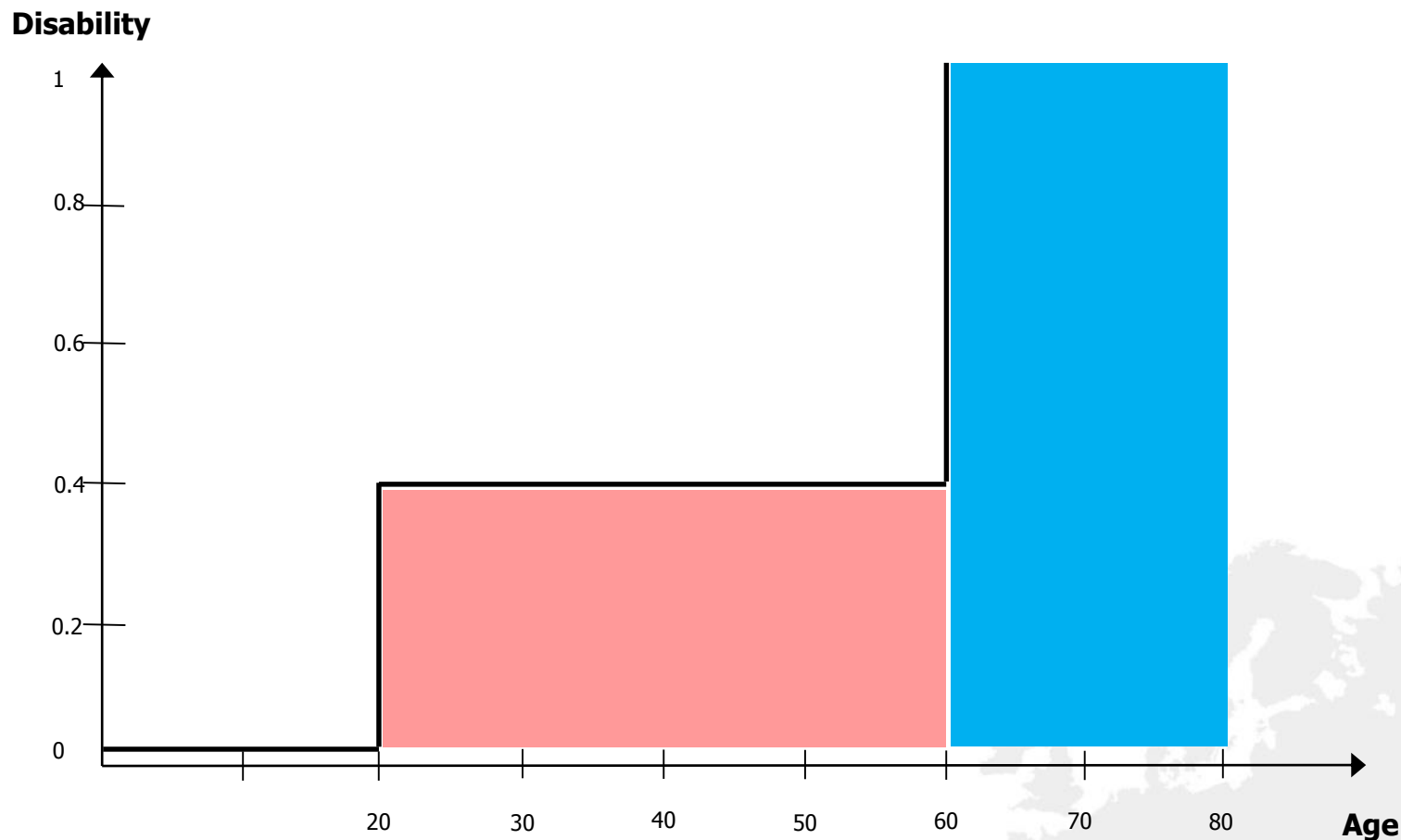
An accident at 20 years old

Disability-adjusted life years (DALYs)



40 years lived with disability weighted 0.4 = 16 YLD

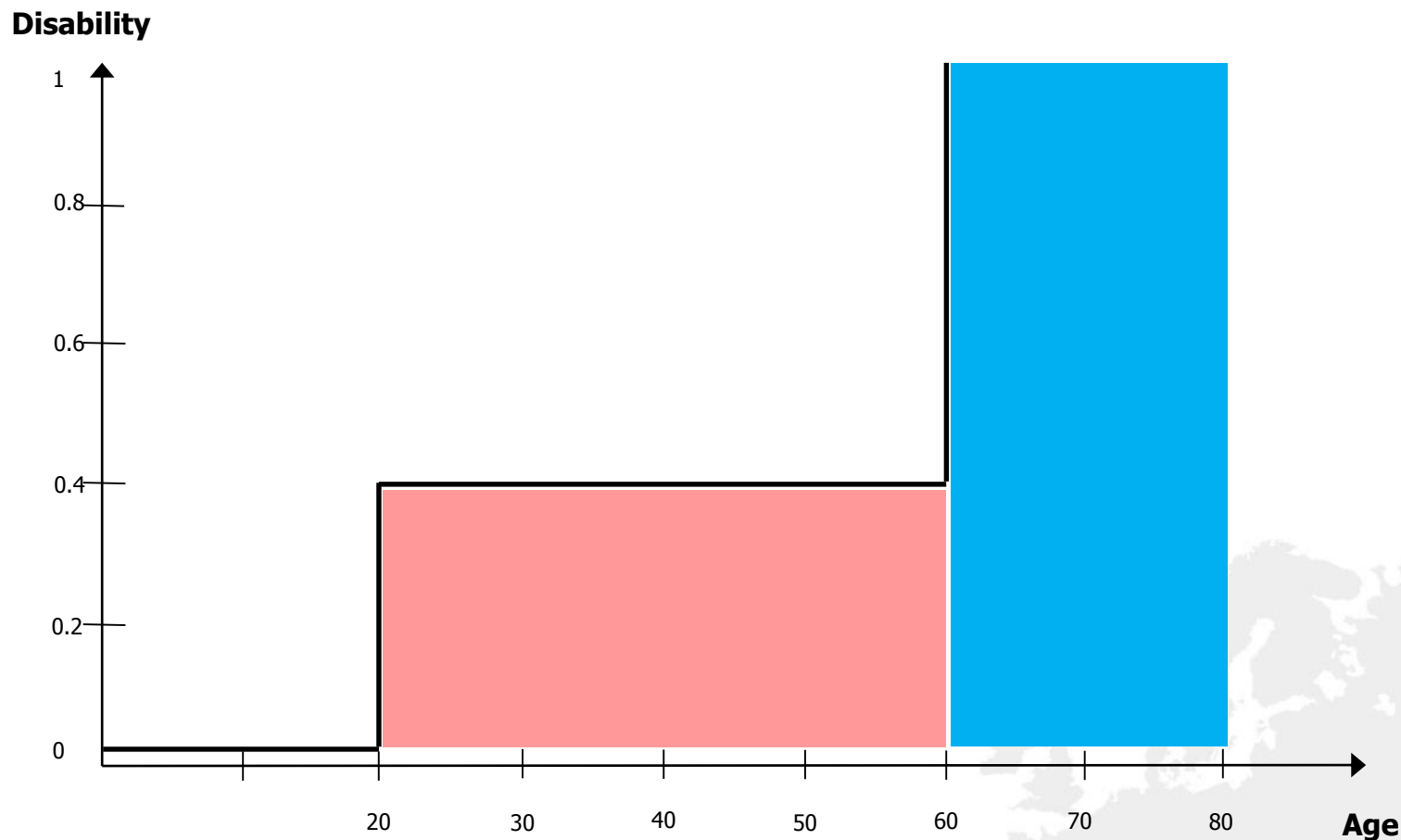
Disability-adjusted life years (DALYs)



Death at 60 years old (80 is standard life expectancy)

20 years of life lost due to premature death (YLL)

Disability-adjusted life years (DALYs)



$$16 \text{ YLD} + 20 \text{ YLL} = 36 \text{ DALYs}$$

Is it possible to estimate the burden of HAIs?

- The burden of HAIs has not been studied adequately despite a significant proportion being preventable

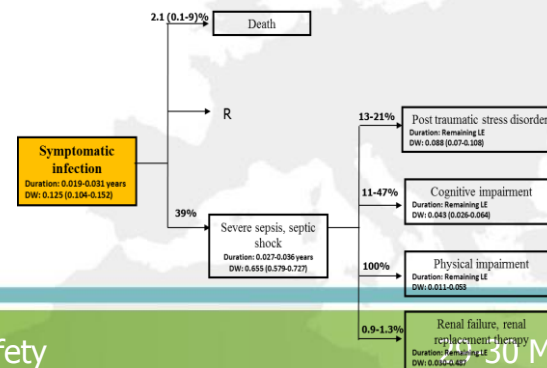
BUT

- HAIs are always associated with comorbidities that contribute to morbidity and mortality
- Administrative hospital discharge data do not accurately reflect the burden of HAIs



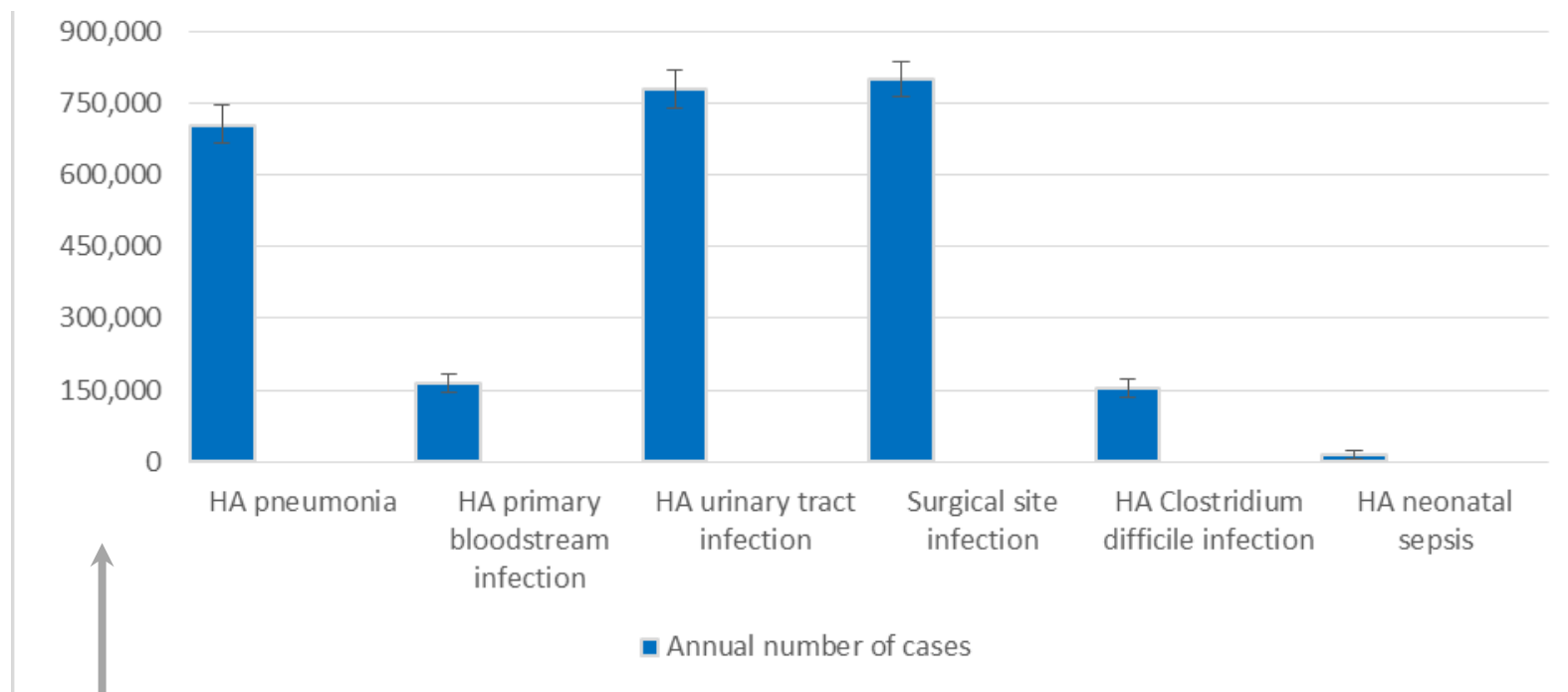
Burden of disease: methodology builds on a number of studies

- **Attributable mortality, sequelae and length of stay:** Systematic review of the literature. Berlin: RKI; 2016.
http://www.rki.de/DE/Content/Institut/OrgEinheiten/Abt3/FG37/Research_Report_BHAI.pdf?__blob=publicationFile
- **Final outcome trees (disease models):** available in the BCoDE toolkit (free software application)
http://ecdc.europa.eu/en/healthtopics/burden_of_communicable_diseases/Pages/Tool.aspx Colzani and Cassini et al. A Software Tool for Estimation of Burden of Infectious Diseases in Europe Using Incidence-Based Disability Adjusted Life Years. PloS One. 2017;12(1):e0170662
- **Incidence data:** Age-group and sex prevalent number of HAIs from the PPS converted into annual incidence rates applying the Rhamme and Sudderth formula. Point prevalence survey of Healthcare-associated infections and antimicrobial use in European acute care hospitals. Stockholm: ECDC; 2013.
- **Disability weights:** Haagsma JA et al. Assessing disability weights based on the responses of 30,660 people from four European countries. Population Health Metrics. 2015; 13: 1-15.
- **Adjusting for impact of co-morbidities on life expectancy: Standard life expectancy table.** McCabe score stratification of cases according to remaining life expectancy; comparison with standard life expectancy (Murray CJ et al. GBD 2010: design, definitions, and metrics. Lancet. 2012 Dec 15;380(9859):2063-6.)



Comparing number of cases and burden of disease

- Age-group and sex prevalent number of HAIs from the PPS was converted into annual incidence rates applying the Rame and Sudderth formula
- 2.6 million annual number of cases of HAIs estimated in the EU/EEA (95% UI: 1,624,140 - 4,084,550)



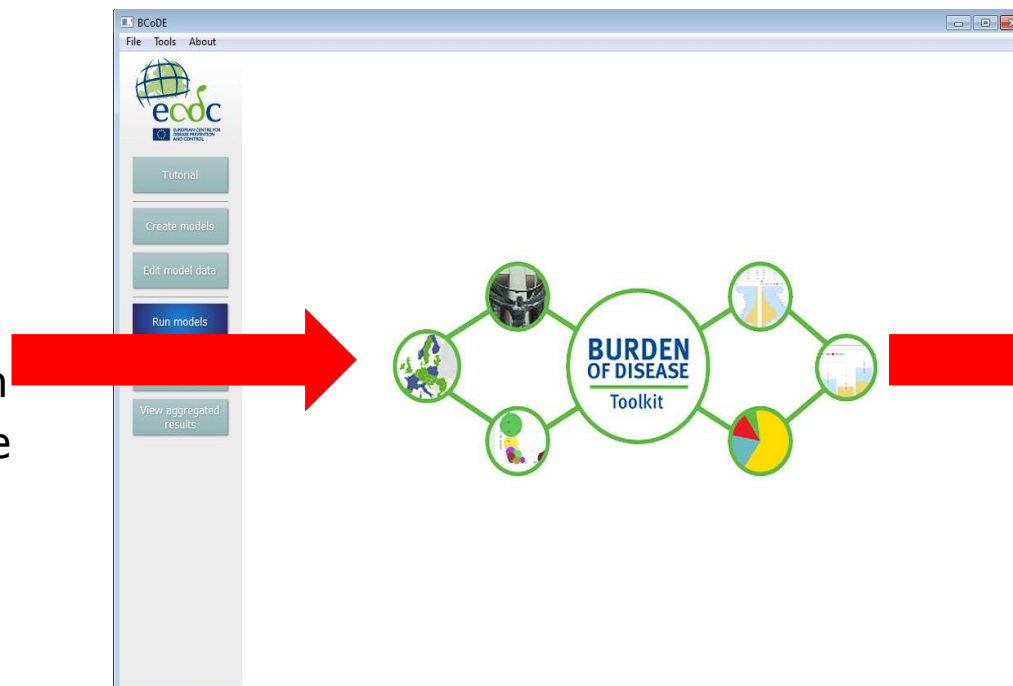
(estimated from ECDC point prevalence survey 2011-2012)

Calculating DALYs: the BCoDE toolkit

Number of cases
by age group and
gender

Life expectancy
adjusted based on
underlying disease

Outcome
probabilities

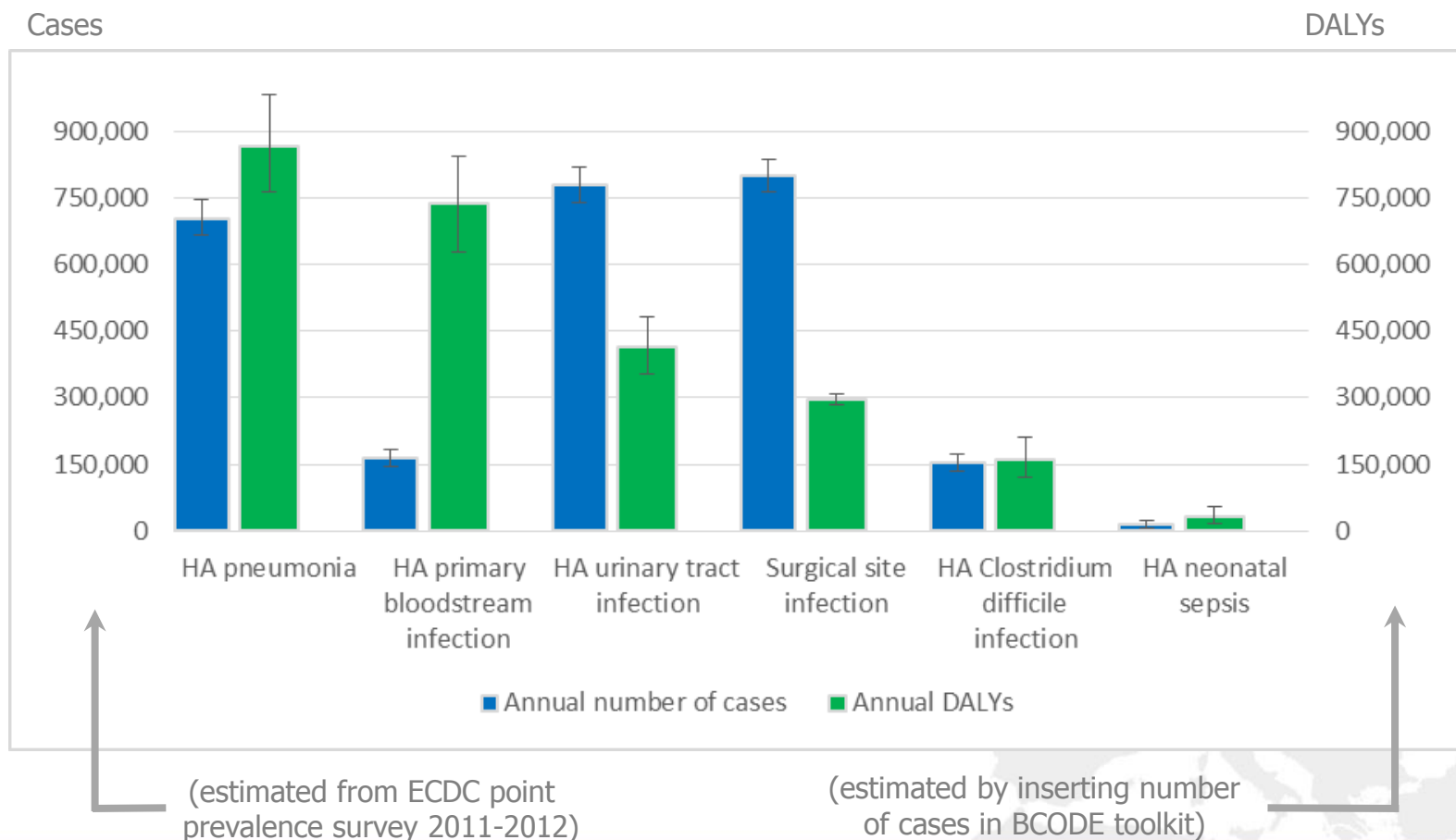


DALYs

Source: http://ecdc.europa.eu/en/healthtopics/burden_of_communicable_diseases/Pages/Tool.aspx

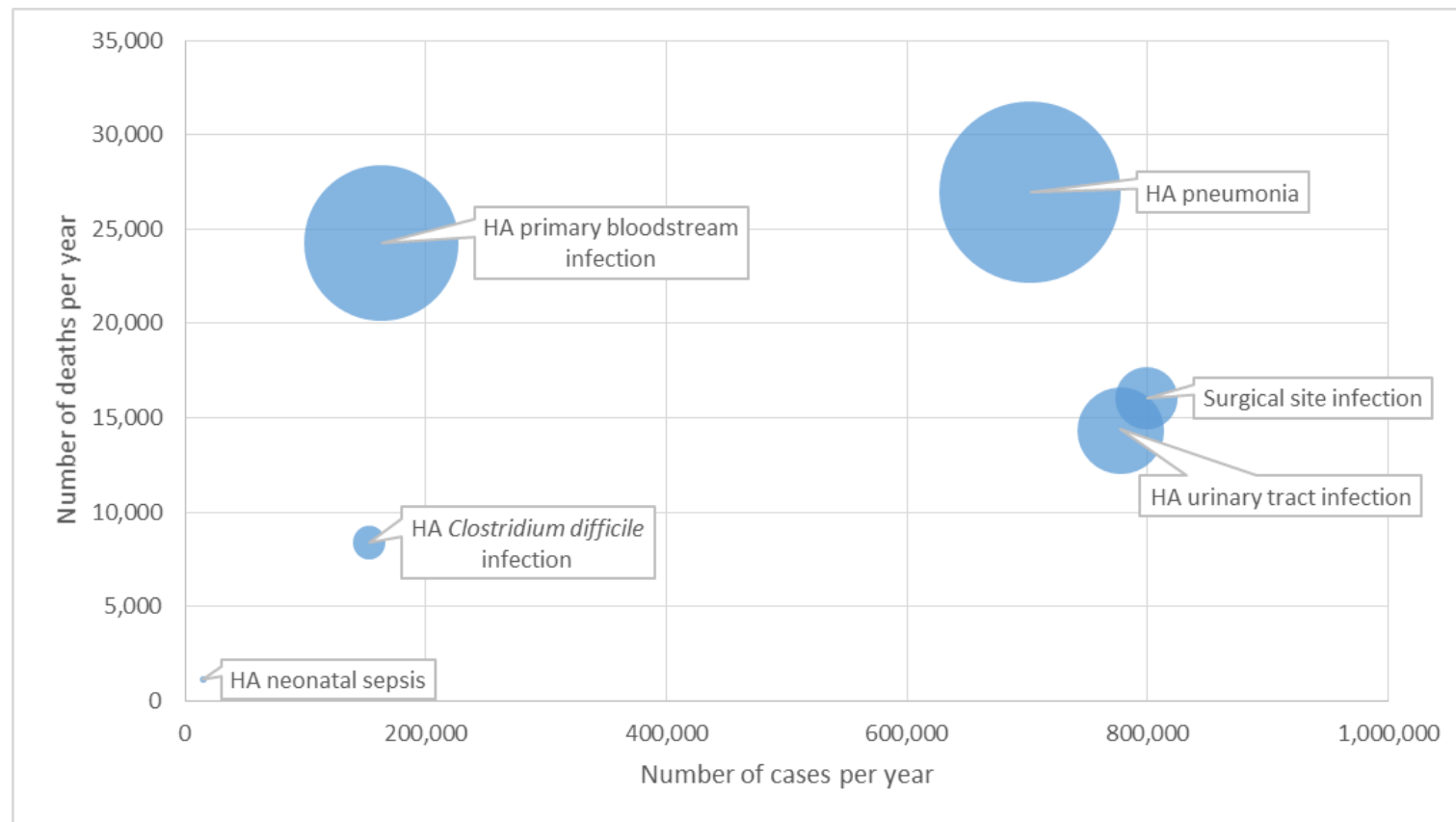
Comparing number of cases and burden of disease

- 2.6 million annual number of cases of HAIs are associated with more than 91,000 deaths (76,000 to 108,000)
- Incidence and prevalence do not provide the full picture



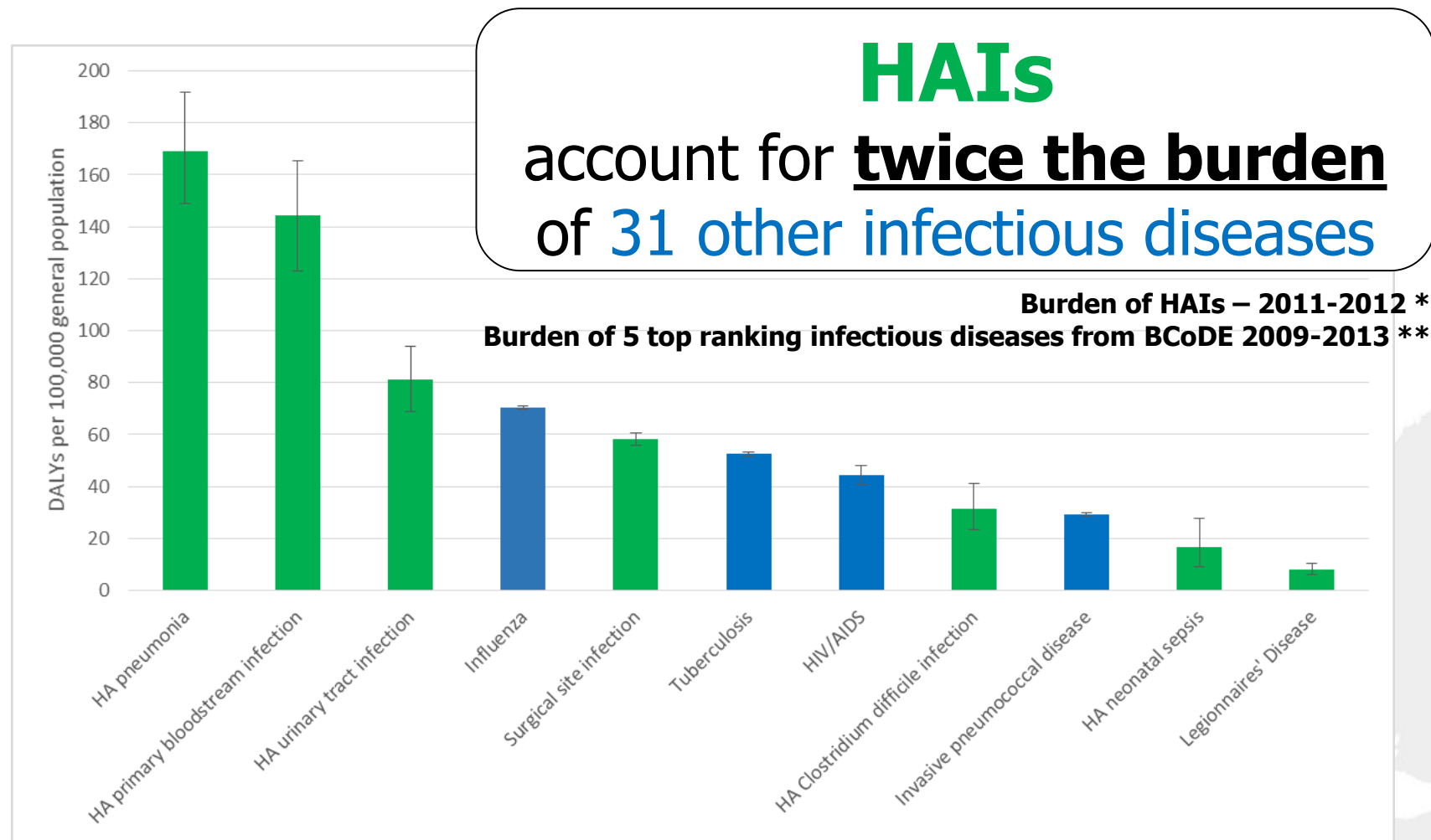
Contribution of incidence and mortality to the burden of HAIs

Burden of HAIs in EU/EEA Member States – 2011-2012
Diameter of bubble reflects DALYs per 100,000.



Source: Cassini A and Plachouras D, et al. PLoS Med 2016;13(10):e1002150 (18 October 2016).

Comparing the burden of HAIs with other infectious diseases (BCoDE project 2015)

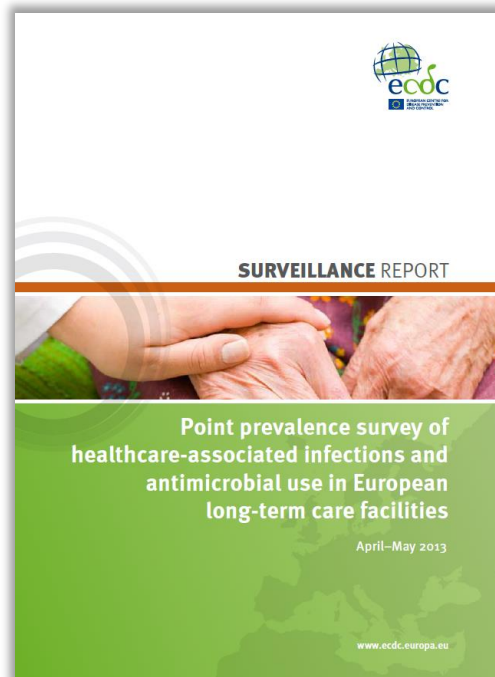
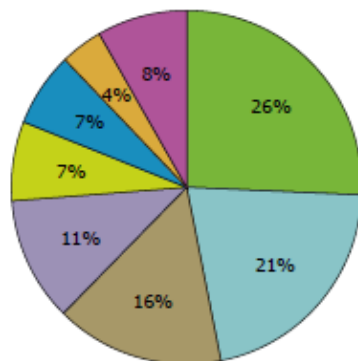
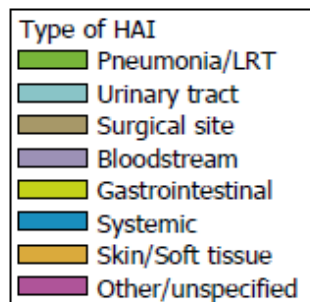


Source: *Cassini A, et al. PLoS Med 2016;13(10):e1002150 (18 October 2016) . ** Cassini A, et al. PLoS Med (submitted).

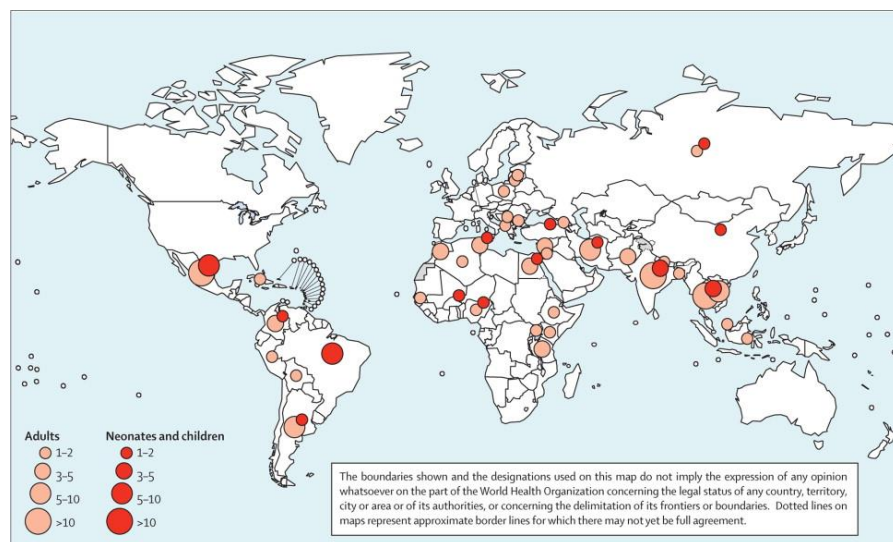
What is the full picture of the burden of HAIs?

Addressing only:

- HAIs in acute care hospitals and not long-term care facilities
- the six most common HAIs that account for almost 80% of HAIs



What is the full picture of the burden of HAIs?



Number of studies reporting health-care-associated infection in developing countries, 1995–2008. Size of dots indicates number of studies.

Allegranzi B, et al. Burden of endemic health-care-associated infection in developing countries: systematic review and meta-analysis. *Lancet*. 2011 Jan 15;377(9761):228-41.

PPS in EU/EEA:
Weighted prevalence of HAIs
5.7% (95 CI: 4.5-7.4)

Meta-analysis in low resource countries:

- Double prevalence
- Triple in ICUs

Health and economic burden of AMR and HAIs



Under construction:

- EARS-Net as main data source for resistant BSI
- For HAIs, PPS data provides information on other infection sites and on severity of co-morbidity
- For non-HAIs, literature reviews fill the gaps on non-BSI
- Literature reviews also help design outcome trees

In collaboration with OECD for the Economic burden of AMR

Take home messages

- Significant challenges in measuring burden of HAIs
 - Data source, co-morbidities, health outcomes
- 2.6 million HAIs associated to more than 91,100 deaths
 - Conservative estimate (70% of HAIs from under-estimated PPS)
- 2.5 million DALYs, $\frac{3}{4}$ lost to premature mortality
 - Remaining are days lived in disability
- Burden of HAIs was higher than other CDs in EU/EEA
 - Composite measures (e.g. DALYs) allow comparisons
- 30 to 50% of the HAIs under study are preventable
 - Lowering the burden in the EU/EEA is an achievable goal
 - Hospitals can become a safer place

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Thank you!

EUROPEAN ANTIBIOTIC AWARENESS DAY



A European Health Initiative



#EAAD

#AntibioticResistance

Questions

For further suggestions, comments and questions please email:

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Thank you!