



World Health
Organization

Patient Safety

A World Alliance for Safer Health Care

SAVE LIVES

Clean Your Hands

Inaugural infection control webinar series

The global burden of health care-associated infections

19 January 2010, 3 pm (CET*)

Benedetta Allegranzi

Deputy Lead

First Global Patient Safety Challenge

Clean Care is Safer Care

WHO Patient Safety



World Health
Organization

Patient Safety

A World Alliance for Safer Health Care

SAVE LIVES

Clean Your Hands

Through the promotion of best practices in hand hygiene and infection control, the **First Global Patient Safety Challenge** aims to reduce health care-associated infection (HCAI) worldwide



Objectives of the Challenge

Burden of HCAI
Stakeholders' engagement

1. Awareness

Country pledges

2. Mobilising nations

Implementation
strategies

3. Technical
guidelines and tools

Estimates of the global burden of health care-associated infection are hampered by limited availability of reliable data



First Challenge area of work on the **burden of health care-associated infection**

Health care-associated infection *is a major patient safety problem*

Affects hundreds of millions of individuals worldwide each year

Multifaceted causation related to:

- systems and processes of care provision
- economic constraints on systems and countries
- human behaviour

Definition of health care-associated infection

“An infection occurring in a patient during the process of care in a hospital or other health-care facility which was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility”

Ducel G et al. Prevention of hospital-acquired infections. A practical guide. WHO 2002

Burden of major infections worldwide

MALARIA

- N° annual episodes: 300-500 mio
- N° annual deaths: 1.5-2.7 mio
- 90 countries at risk worldwide

HIV

- N° affected: 39.5 mio
- N° new infections/year: 4.3 mio
- N° deaths in 2006: 2.9 mio
- Most countries affected with different infection rates

TUBERCULOSIS

- N° new infections/year: 8 mio
- N° deaths in 2005: 1.6 mio
- 1/3 of the world currently affected

HEALTHCARE-ASSOCIATED INFECTIONS



Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data



Alan D Lopez, Colin D Mathers, Majid Ezzati, Dean T Jamison, Christopher J L Murray

Summary

Background Our aim was to calculate the global burden of disease and risk factors for 2001, to examine regional trends from 1990 to 2001, and to provide a starting point for the analysis of the Disease Control Priorities Project (DCPP).

Methods We calculated mortality, incidence, prevalence, and disability adjusted life years (DALYs) for 136 diseases and injuries, for seven income/geographic country groups. To assess trends, we re-estimated all-cause mortality for 1990 with the same methods as for 2001. We estimated mortality and disease burden attributable to 19 risk factors.

Findings About 56 million people died in 2001. Of these, 10.6 million were children, 99% of whom lived in low-and-middle-income countries. More than half of child deaths in 2001 were attributable to acute respiratory infections, measles, diarrhoea, malaria, and HIV/AIDS. The ten leading diseases for global disease burden were perinatal conditions, lower respiratory infections, ischaemic heart disease, cerebrovascular disease, HIV/AIDS, diarrhoeal diseases, unipolar major depression, malaria, chronic obstructive pulmonary disease, and tuberculosis. There was a 20% reduction in global disease burden per head due to communicable, maternal, perinatal, and nutritional conditions between 1990 and 2001. Almost half the disease burden in low-and-middle-income countries is now from non-communicable diseases (disease burden per head in Sub-Saharan Africa and the low-and-middle-income countries of Europe and Central Asia increased between 1990 and 2001). Undernutrition remains the leading risk factor for health loss. An estimated 45% of global mortality and 36% of global disease burden are attributable to the joint hazardous effects of the 19 risk factors studied. Uncertainty in all-cause mortality estimates ranged from around 1% in high-income countries to 15–20% in Sub-Saharan Africa. Uncertainty was larger for mortality from specific diseases, and for incidence and prevalence of non-fatal outcomes.

Lancet 2006; 367: 1747–57

School of Population Health,
University of Queensland,
Brisbane 4006, Australia
(Prof A D Lopez PhD);
Department of Measurement
and Health Information
Systems, WHO, Geneva,
Switzerland (C D Mathers PhD);
Harvard School of Public
Health, Boston, MA, USA, and
Harvard University Initiative
for Global Health, Cambridge,
MA, USA (M Ezzati PhD,
C J L Murray MD); and Fogarty
International Center, National
Institutes of Health,
Washington, DC, USA, and
University of California,
San Francisco, CA, USA
(D T Jamison PhD)

Correspondence to:
Prof Alan Lopez
a.lopez@sph.uq.edu.au

THE GLOBAL BURDEN OF DISEASE

2004 UPDATE





ANNUAL EPIDEMIOLOGICAL REPORT ON COMMUNICABLE DISEASES IN EUROPE 2008

REPORT ON THE STATE OF
COMMUNICABLE DISEASES IN THE
EU AND EEA/EFTA COUNTRIES

- Section on HAI
- **European countries' national surveillance systems reporting to ECDC:** Italy, Croatia, Norway, France, Portugal, Germany, UK, Austria, Finland, Hungary, Lithuania, Netherlands, Spain, Belgium, Luxemburg, Slovakia, Romania
- New report only dedicated to HAI to be issued in 2010

CALCULATING ROUGH ESTIMATES OF THE HAI BURDEN...

HAI RATES IN MEMBER STATES

Average HAI rate: 10%

Average HAI attributable mortality: 5%

ALL countries affected worldwide

Global hospital admissions per year: ?

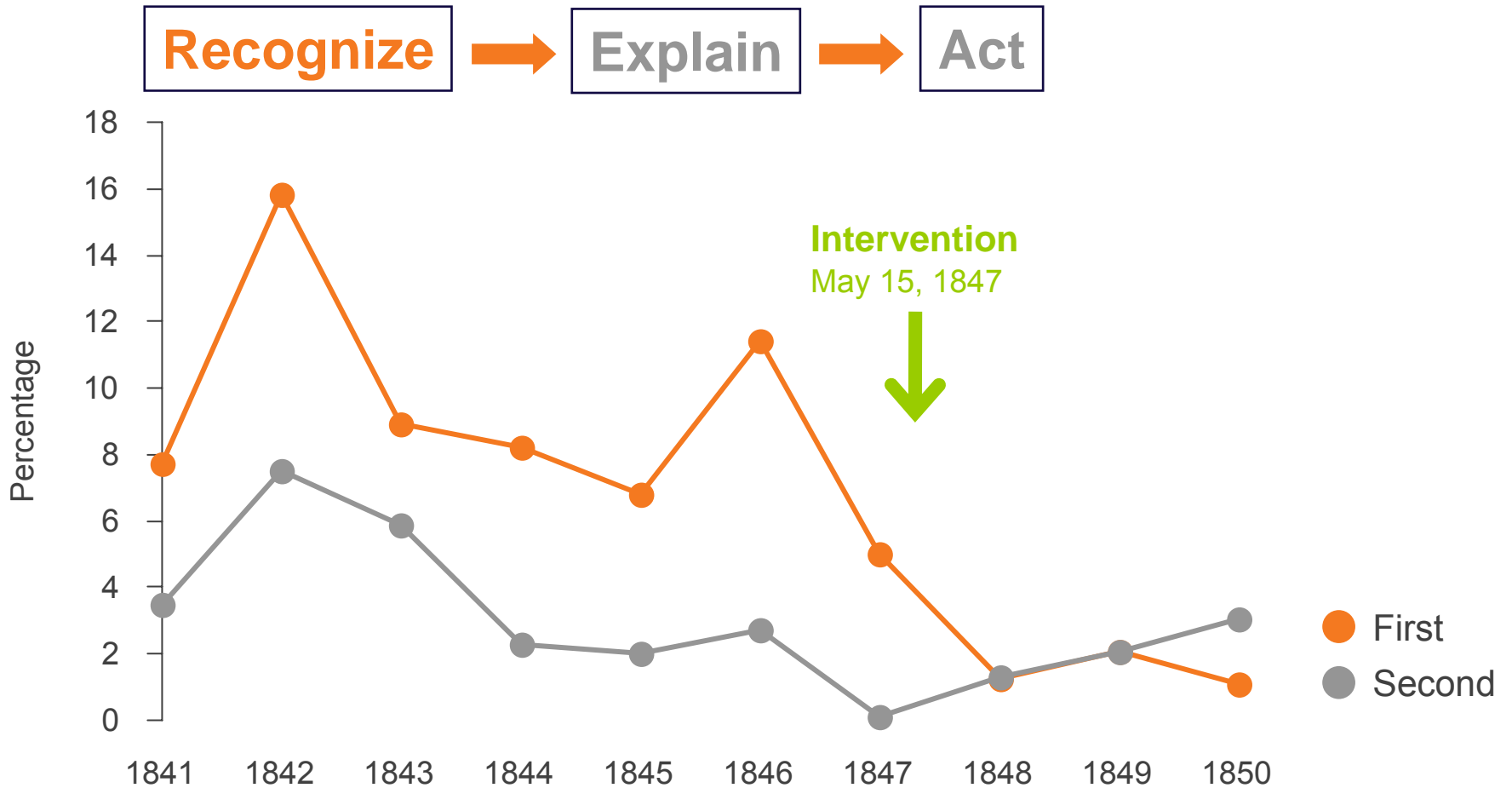
Affected patients/year: ?

N° deaths/year: ?

Reasons why estimating the burden of HAI is difficult

- Other health priorities prevailing
- Lack of denominator(s)
- Difficulties in conducting surveillance:
 - Need for expertise, time, funds
 - Use of standardized definitions
 - Distinction between infection/colonization/contamination
 - Establishing the association with health care
 - Evaluation of clinical evidence (e.g. surgical wound, catheter insertion site, etc)
 - Need for information from the patient records
 - Performance of microbiologic tests and other investigations
- Interpretation and use of data

Lessons learned from Semmelweis (1861)



Effectiveness of surveillance to reduce HAI

(Gastmeier et al, JHI 2006)

Table I Participating intensive care units (ICUs) and surgical departments and infection rates from 1997 to 2003

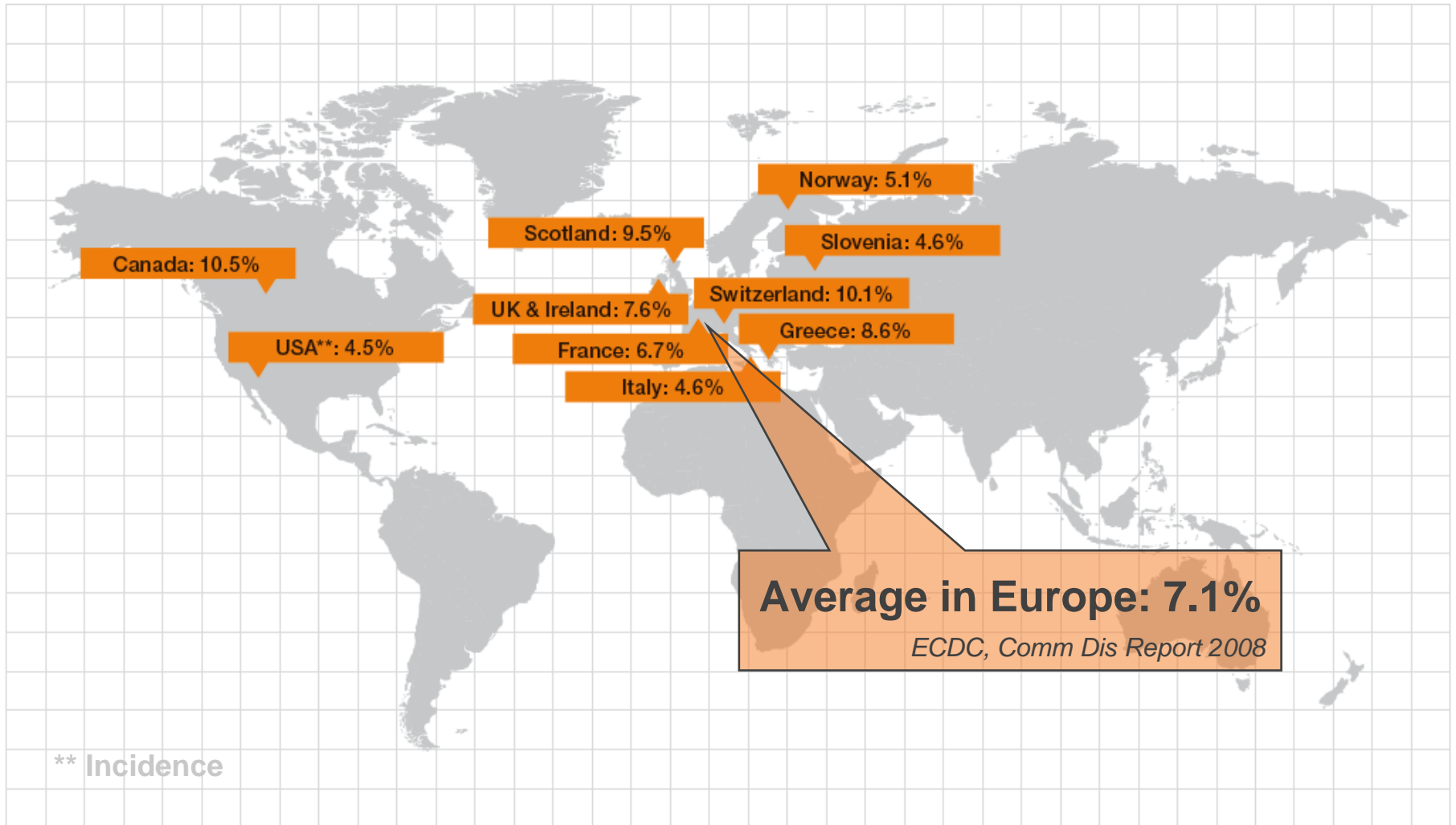
Year	ICU component						SSI component				
	ICUs participating	Ventilator-days	VAP	VAP rate (per 1000 ventilator-days)	Catheter-days	CR-BSI	CR-BSI rate (per 1000 catheter-days)	Departments participating	Operative procedures	Inpatient SSI	Inpatient SSI rate (%)
1997	24	32 054	483	15.1	55 851	118	2.1	10	3832	69	1.8
1998	69	84 684	902	10.7	141 939	241	1.7	24	12 581	238	1.9
1999	113	121 648	1139	9.4	203 182	409	2.0	54	22 511	427	1.9
2000	171	183 829	1602	8.7	306 689	527	1.7	96	39 375	601	1.5
2001	214	225 133	1776	7.9	383 176	695	1.8	122	53 080	838	1.6
2002	246	255 819	1809	7.1	437 585	748	1.7	161	61 554	981	1.6
2003	248	273 970	1750	6.4	465 119	920	2.0	182	66 592	991	1.5
Total	309	1 177 137	9461	8.0	1 993 541	3658	1.8	243	259 525	4215	1.6

SSI, surgical site infection; VAP, ventilator-associated pneumonia; CR-BSI, central-venous-catheter-related primary bloodstream infection.

Relative Risk (1st year vs 3rd year):

- VAP: 0.71 (95% CI: 0.66-0.76)
- CR-BSI: 0.80 (95% CI: 0.72-0.90)
- SSI: 0.72 (95% CI: 0.64-0.80)

Prevalence of HAI in developed countries



HAI burden in USA

- Incidence: **5–6%**; **1,7 million** affected patients
 - Urinary Tract Infection: 36%; 561,667 episodes, 13,088 deaths
 - Surgical Site Infection: 20%; 274,098 episodes (1.98%)
 - Catheter Related Bloodstream Infections: 11%; 250,000 episodes,
28,000 deaths
 - Ventilator Associated Pneumonia: 11%; 5.4/1000 ventilator-days
- Attributable mortality: **3.6%**, approximately **99,000 deaths**
- Annual economic impact: about **US\$ 4,5 billion**

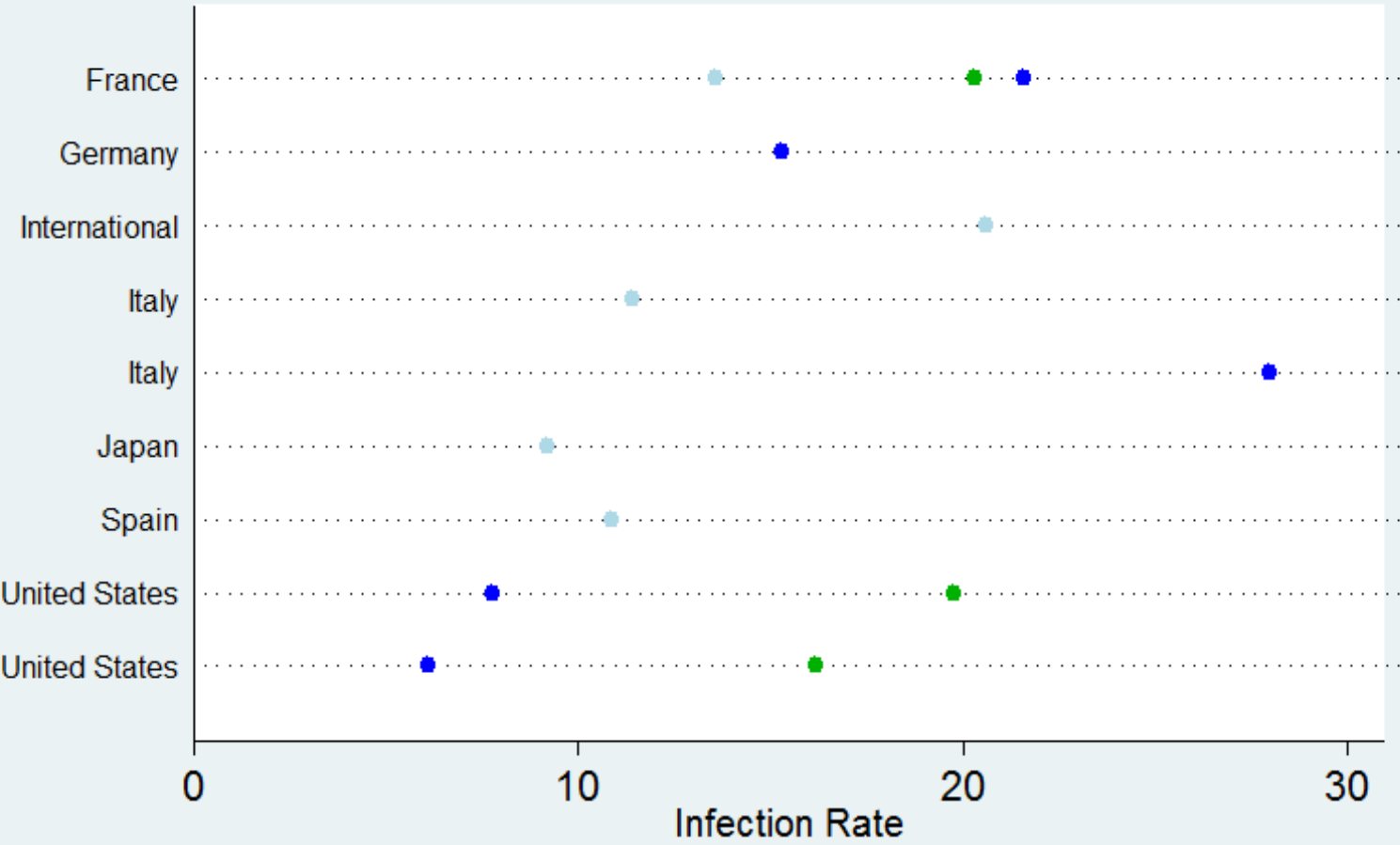
Klevens RM, et al. Public Health Reports 2007

HAI burden in Europe

- **Prevalence: 3.5–14.8% (average: 7.1%)**
 - **4 131 000** affected patients
 - **4 544 100** episodes of HAI every year
 - **16 million** extra days of hospital stay
 - **37 000** attributable deaths (and contribution to an additional 110 000)
 - **Annual economic impact: about EUR 7 billion** per year (including direct costs only)
- (ECDC, Comm Dis Report 2008)*

Country	N° of cases/year	N° of deaths/year	Costs/year
UK	100,000	5,000	UK£ 1 billion
Scotland	/	/	UK£ 183 mio
Switzerland	70,000	/	CHF 230-300 mio

HAI rates in adult high-risk patients in Developed Countries*



*Systematic review of the literature conducted by WHO

● Infections/100 patients
● Infected patients/100 patients
● Infections/1000 patient-days

The impact of HCAI

HCAI can cause:

- more serious illness
- prolongation of stay in a health-care facility
- long-term disability
- excess deaths
- high additional financial burden
- high personal costs on patients and their families

Impact of nosocomial infections

Attributable mortality
0% to 40%

Prolongation of length of stay
5 to 25 days

Increase of costs
5,000 to 40,000 euros



Facts about health-care associated infection in developing countries

- The risk of infection is 2-20 times higher than in developed countries, and the proportion of patients infected can exceed 25% (Allegranzi B & Pittet D, ICHE 2007)
- **Unsafe blood transfusion** causes every year:
 - 16 million hepatitis B infections,
 - 5 million hepatitis C infections, and
 - 160 000 cases of HIV
- **Reuse of contaminated syringes** caused in 2000:
 - 21 million hepatitis B infections (33% of new infections)
 - 2 million hepatitis C infections (40% of new infections)
 - 260 000 HIV infections (5% of new infections)
- **Unsafe waste disposal:** in 22 developing countries, the proportion of facilities using inappropriate waste disposal methods ranges from 18% to 64%

Conditions leading to higher HAI burden in developing countries

- Inadequate hygiene conditions
- Poor infrastructure
- Inadequate / insufficient equipment
- Lack of microbiological information
- Understaffing
- Overcrowding
- Lack of knowledge and low staff preparedness
- Inappropriate use of antibiotics
- More diseased population
- Unfavorable social background
- Lack of national policies and programs
- Costs falling on individual patients

Allegranzi B, Pittet D. Infect Control Hosp Epidemiol 2007;28:1323-27

IC constraints to IC in Africa at national level

Constraints

- Absence of policies
- Absence of guidelines for IC
- Insufficient funds
- Inappropriate organizational structures & coordination
- **Lack of data collection**
- Inadequate human resources
- Lack of monitoring & evaluation
- Insufficient commitment of partners
- Inadequate infrastructure
- Insufficient sensitization of HCWs to policies

First GPSC African workshop, Rwanda, December 2007



World Health
Organization

Patient Safety

A World Alliance for Safer Health Care

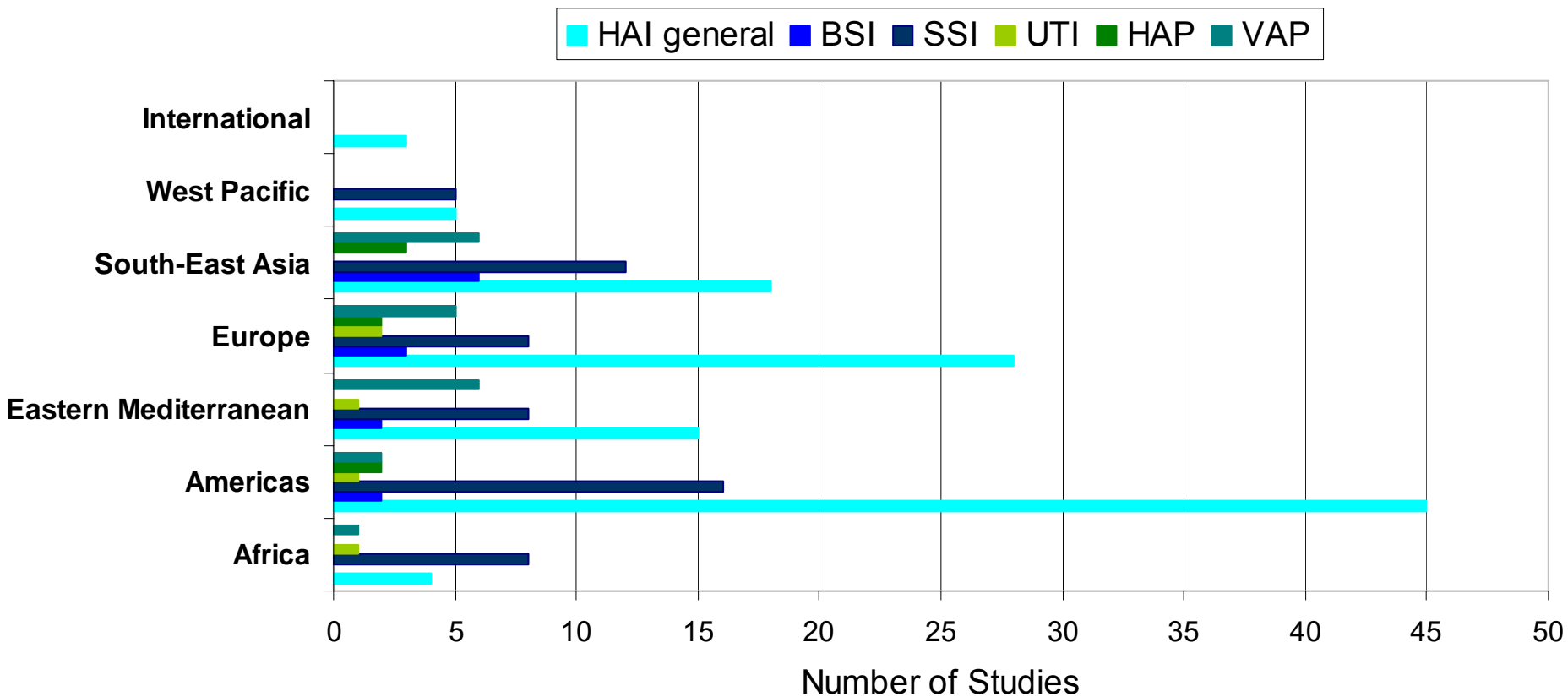
SAVE LIVES

Clean Your Hands

Systematic literature review on HAI rates in developing countries 1995-2008

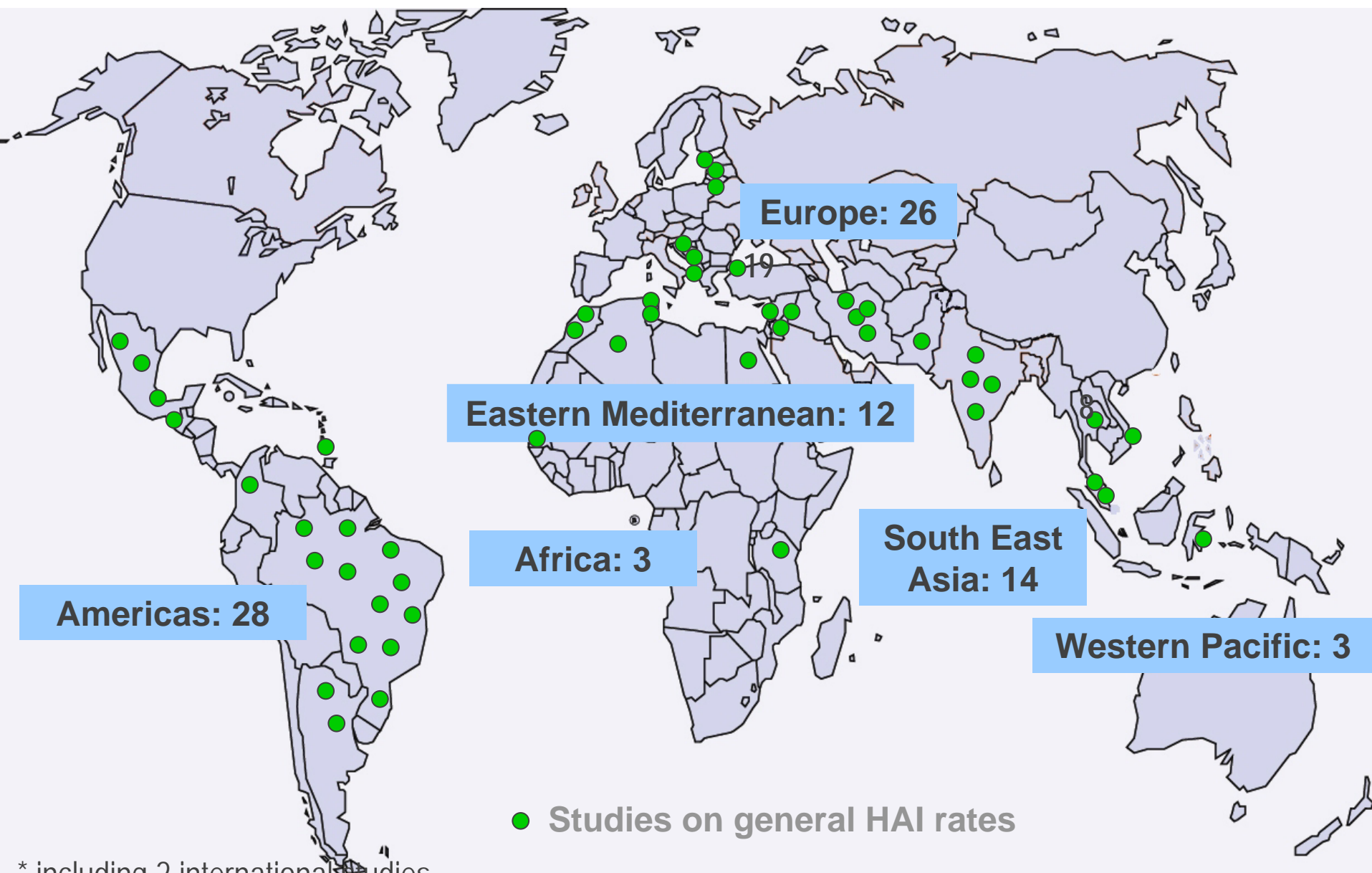
Study distribution per region

Type of Infection per WHO Region



Systematic review of the literature conducted by WHO

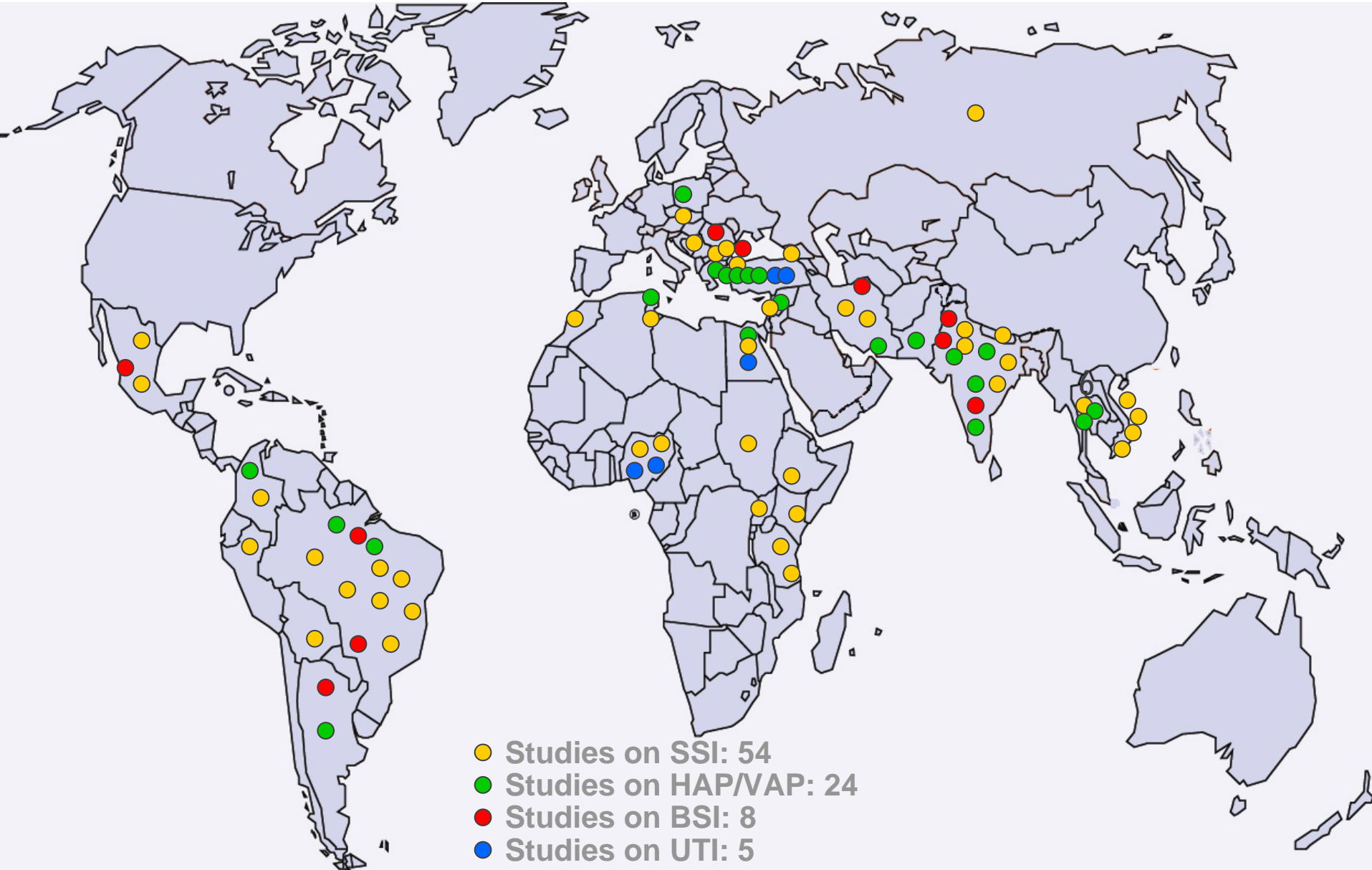
Studies on general HAI rates from developing countries (1995-2008): 89*



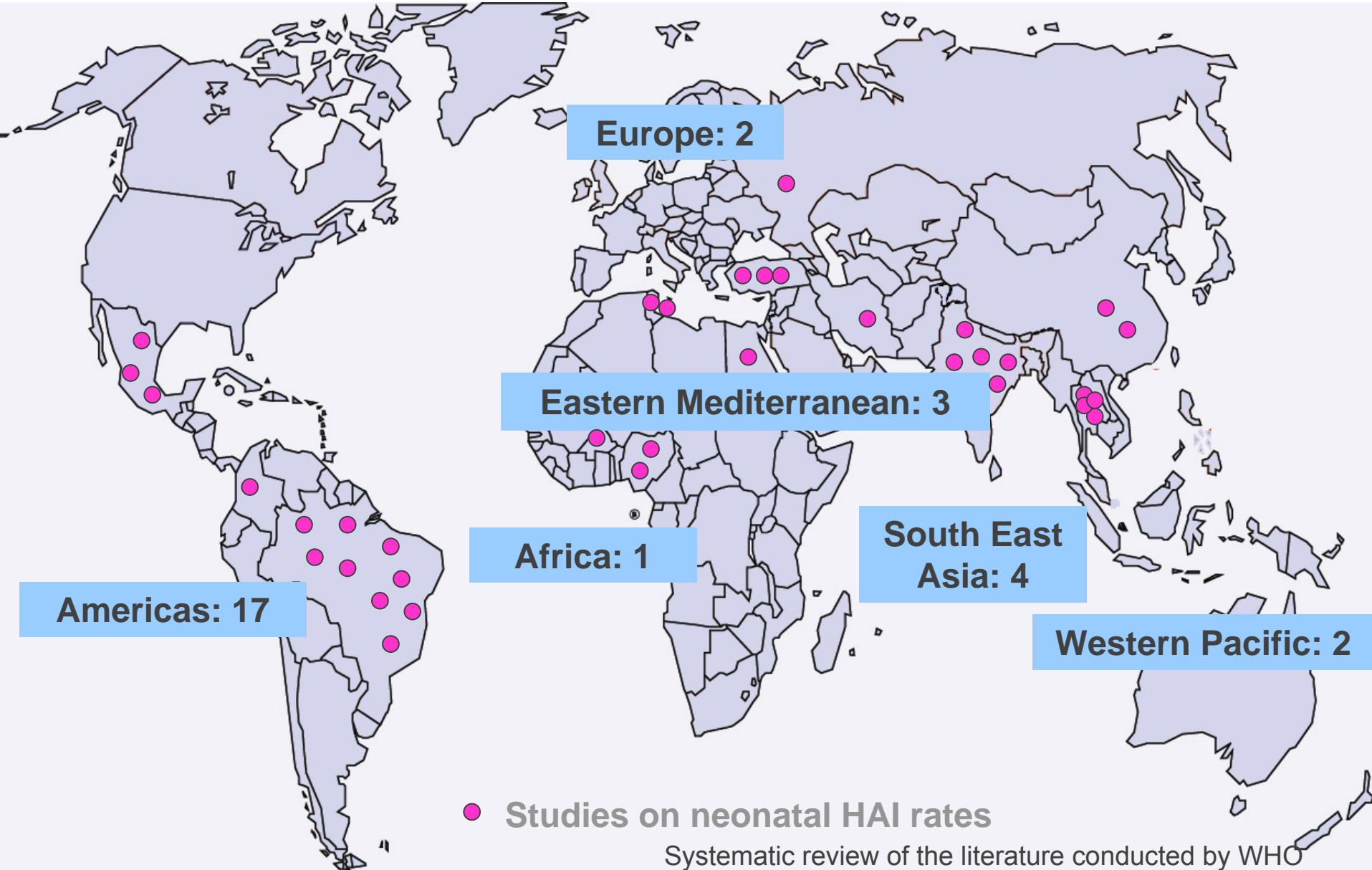
* including 2 international studies

Systematic review of the literature conducted by WHO

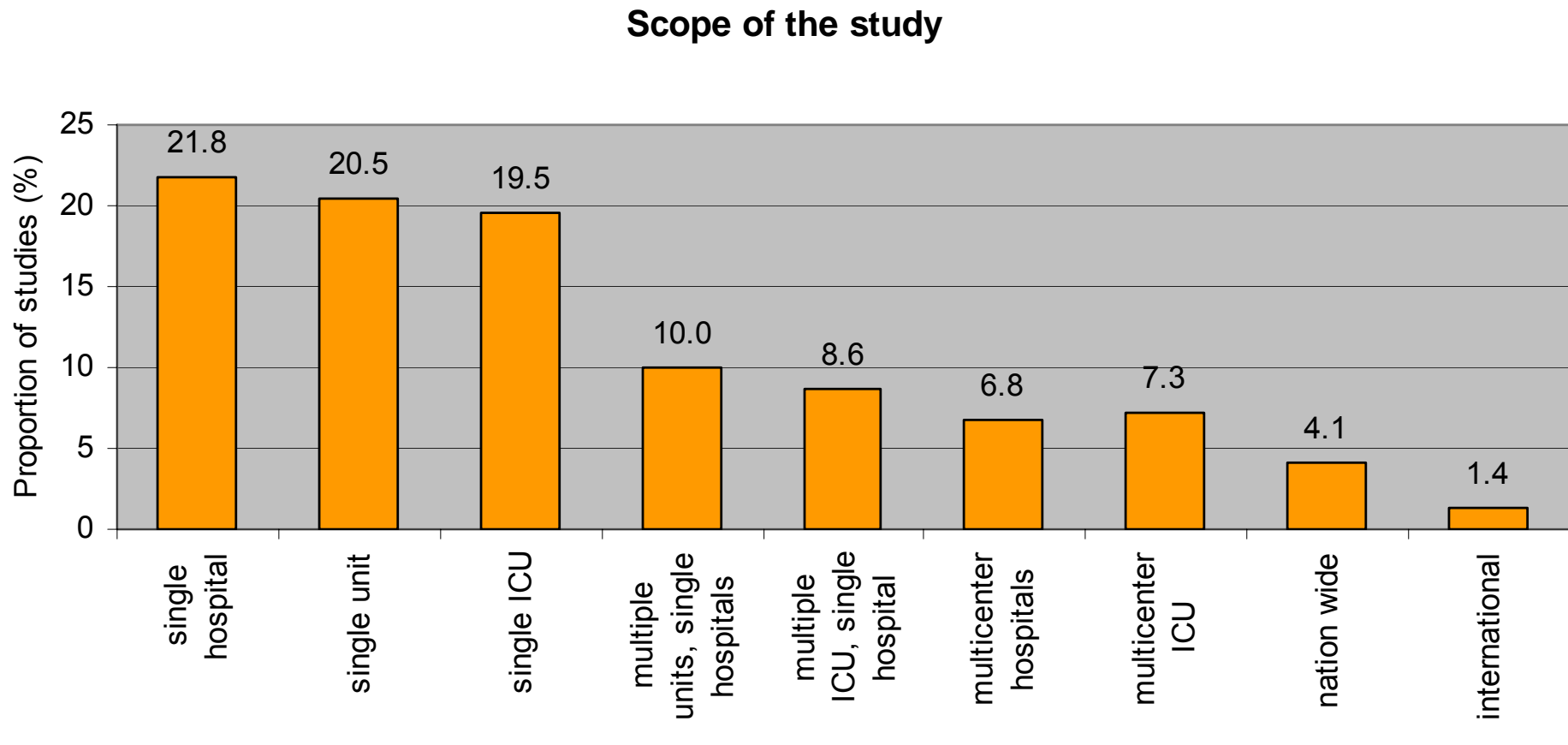
Studies on specific site infection rates in adult patients from developing countries (1995-2008): 91



Studies on neonatal/pediatric HAI rates from developing countries (1995-2008): 29

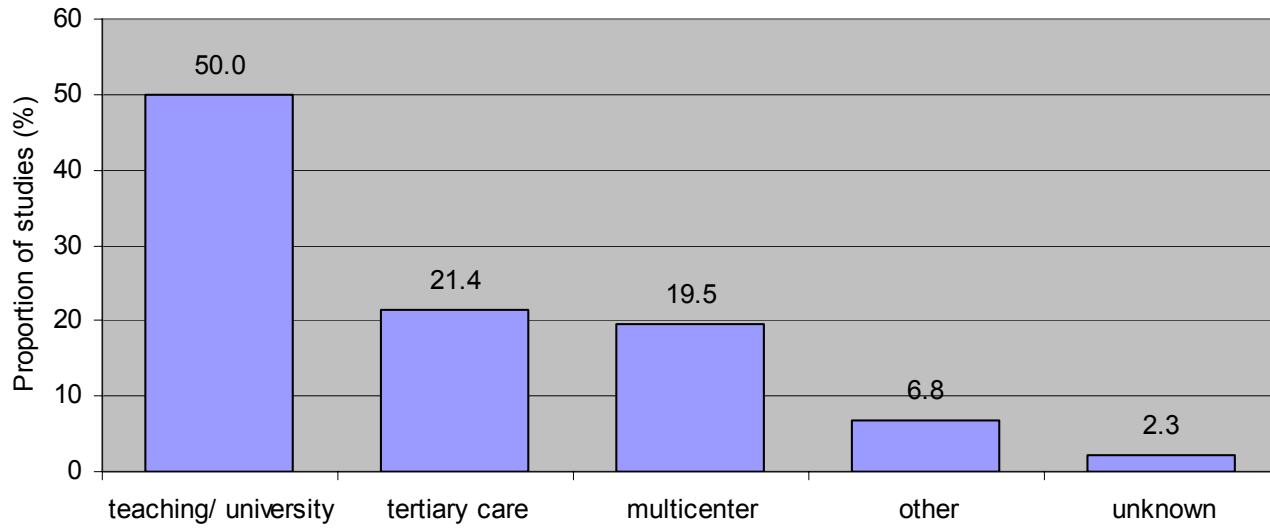


Scope of the studies

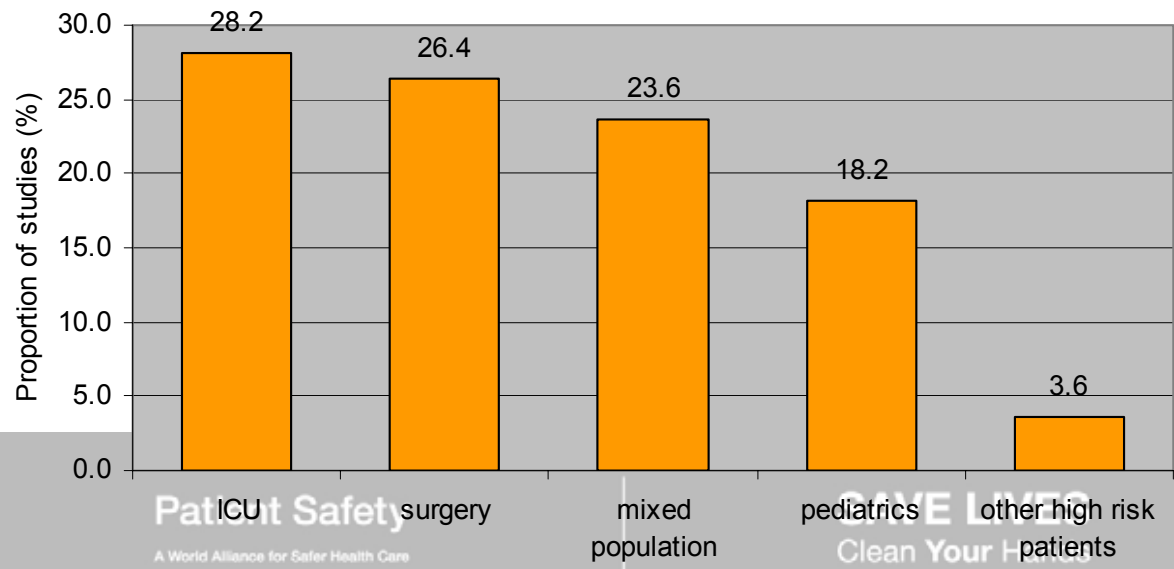


Systematic review of the literature conducted by WHO

Type of setting

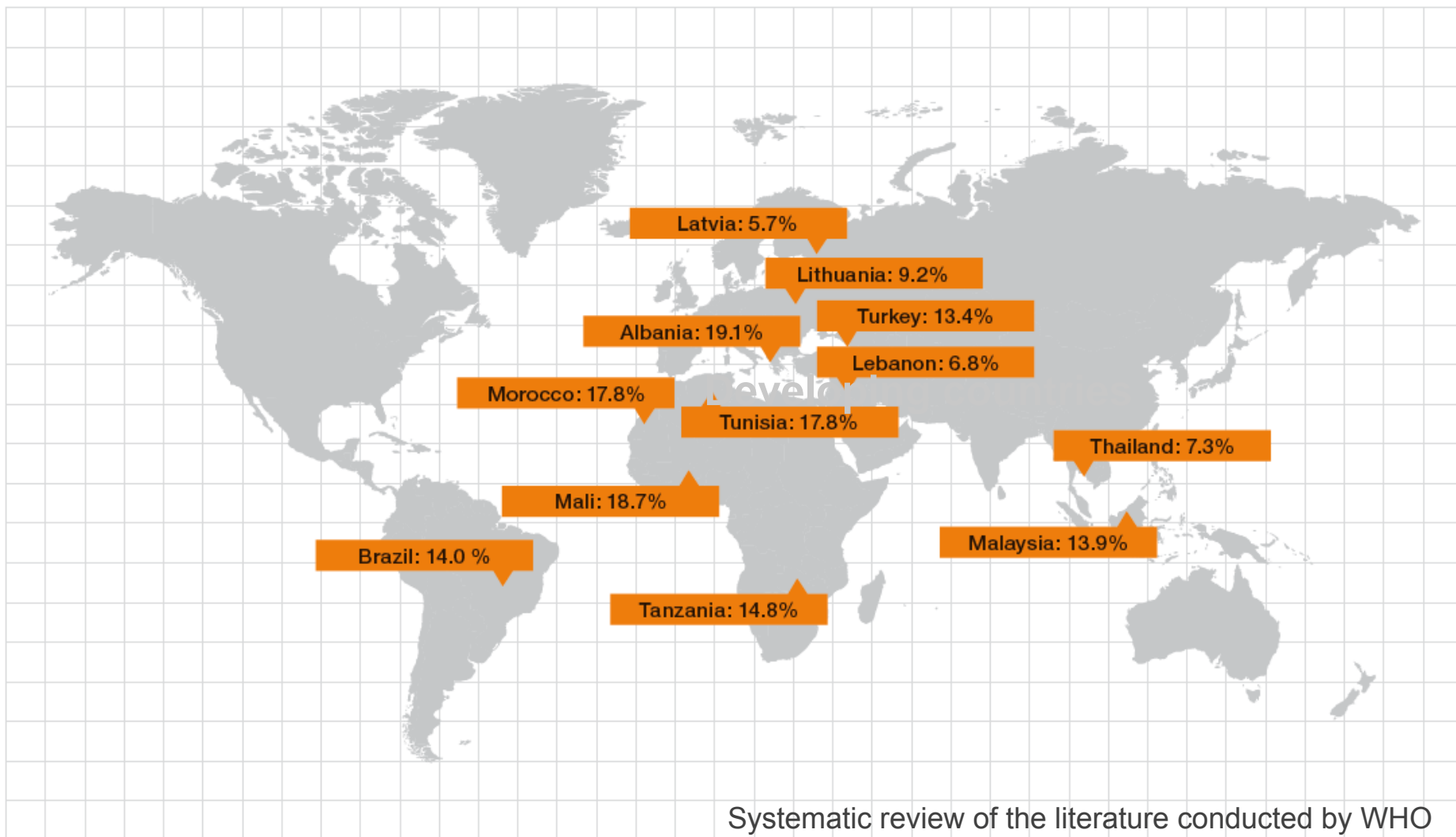


Type of patients

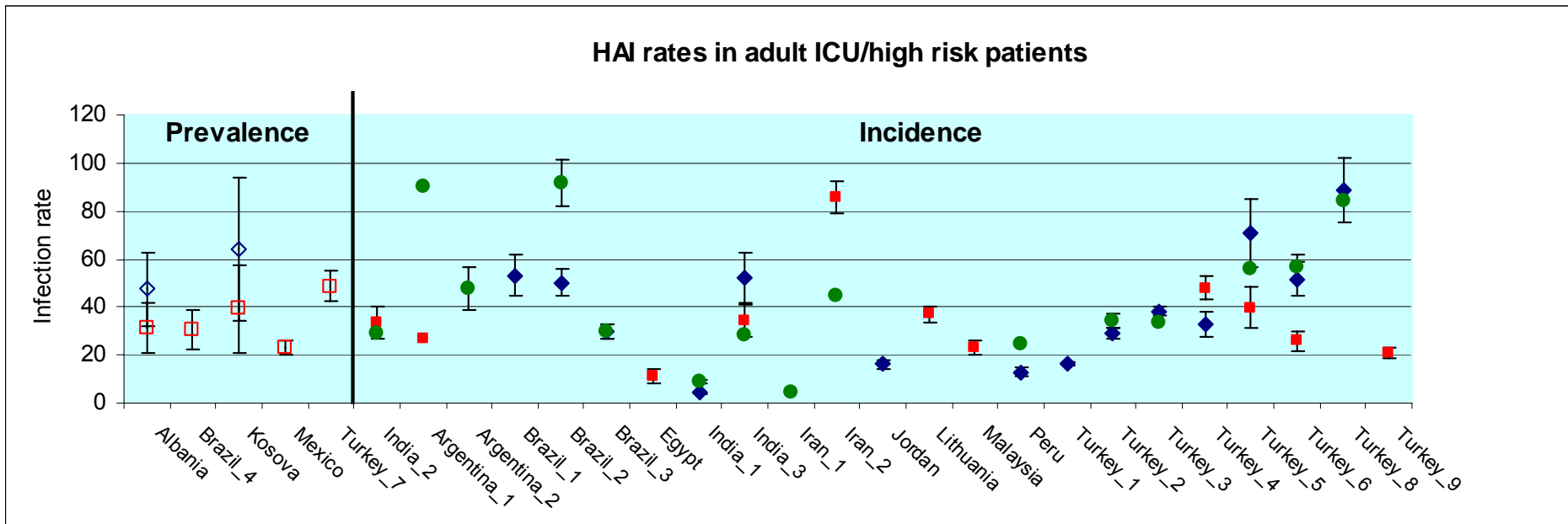


Systematic review of the literature
conducted by WHO

Prevalence of HAI in developing countries



HAI rates in adult ICU/high risk patients



Range: 4.1-90.1 inf./1000 pts-days
 USA: 13.04 inf./1000 pts-days

- ◆ Infections/ 100 patients (incidence)
- ◇ Infections/ 100 patients (prevalence)
- Infect. Pat./100 pat. (incidence)
- Infect. Pat./100 pat. (prevalence)
- Infections/ 1000 pat. days (incidence)

Device-associated infection rates in ICUs in developing countries compared to NHSN rates

Surveillance network, study period, country	Setting	No. of patients	CLA-BSI*	VAP*	CR-UTI*
NHSN, 2006–2007, USA ¹	PICU	/	2.9	2.1	5.0
INICC, 2002–2007, 18 developing countries ^{†2}	PICU	1,808	6.9	7.8	4.0
NHSN, 2006–2007, USA ¹	Adult ICU#	/	1.5	2.3	3.1
INICC, 2002–2007, 18 developing countries ^{†2}	Adult ICU#	26,155	8.9	20.0	6.6
Argentina (various studies)	Adult ICU (any type)	/	25.8	49.5	18.5
Brazil (various studies)	Adult ICU (any type)	/	/	22.7	/
India (various studies)	Adult ICU (any type)	/	5.6	20.9	6.3
Turkey (various studies)	Adult ICU (any type)	/	13.6	21.2	11.0

* Overall (pooled mean) infection rates/1000 device-days

INICC = International Nosocomial Infection Control Consortium; NHSN = National Healthcare Safety Network; PICU = paediatric intensive care unit; CR-BSI = catheter-related bloodstream infection; VAP = ventilator-associated pneumonia; CR-UTI = catheter-related urinary tract infection.

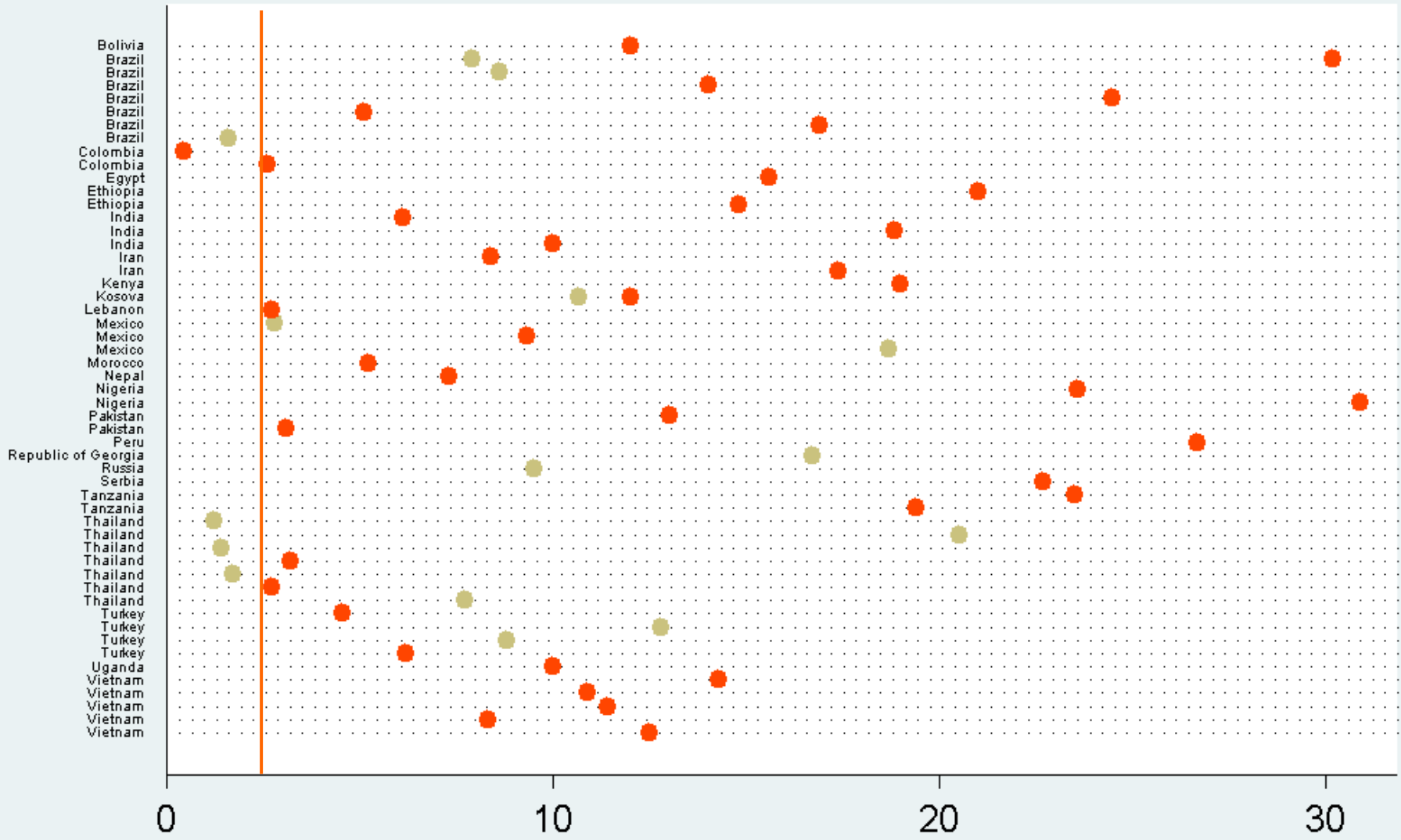
¹ NHSN report. *Am J Infect Control* 2008

² Rosenthal V et al. *Am J Infect Control* 2008

† Argentina, Brazil, Colombia, Costa Rica, Cuba, El Salvador, India, Kosova, Lebanon, Macedonia, Mexico, Morocco, Nigeria, Peru, Philippines, Turkey, Uruguay

Medical/surgical ICUs

Surgical Site Infection Rates in Developing Countries



Range: 2.6-30.9%

● SSI/100 surg pat
● SSI/100 operation

Infections in neonatal patients

- Neonatal infection rates in developing countries are 3-20 times higher than in industrialized countries
- Among hospital-born babies these infections are responsible for 4% to 56% of all causes of death in the neonatal period, (3/4 in South East Asia and sub-Saharan Africa) (*Zaidi et al, Lancet Infect Dis 2005*)
- **Brazil (various papers):**
 - Overall infection rates in NICUs: 38.6%
 - HAI incidence density: 37.3±16.4 infections per 1000 patient-days (pooled weighted means) (6.9 infections per 1000 patient-days in the USA, *Klevens et al, Public Health Reports 2007*)

Systematic review of the literature conducted by WHO

Risk factors for HAI in multivariate analysis

RISK FACTOR	N° of STUDIES	COUNTRIES
HAI GENERAL	5	
- Length of stay	4	Tanzania, Mexico, Lebanon, Morocco
- Surgery	3	Mexico, Cuba, Morocco
- Intravascular catheter	3	Cuba, Tunisia, Morocco
- Urinary catheter	3	Cuba, Lebanon, Morocco
- CVC	1	Lebanon
- Age	1	Mexico
- Immunodeficiency	1	Cuba
- Pediatrics	1	Mexico
HAI IN ICU	6	
- Length of stay in ICU	4	India, Mexico, Turkey, Egypt
- Surgery	3	Mexico, Brazil, Turkey
- Sedative medication	2	Mexico, Turkey
- Parenteral nutrition	1	India
- Neurological failure at admission	1	Mexico
- Hyperosmolar solution	1	Mexico
- Nasogastric tube	1	Brazil
- Age	1	Brazil
- Pulmonary diagnosis at admission	1	Turkey
- Tracheostomy	1	Turkey
- CVC	1	Turkey
- Community onset infection at admission	1	India

Impact of HAI in some developing countries

COUNTRY	SETTING	INFECTION RATE	MORTALITY	EXTRA LOS (days)	EXTRA COST
Argentina	ICUs	/	/	VAP: 9 CVC-BSI: 12	VAP: US\$ 2,255/case CVC-BSI: US\$ 4,888/case
Brazil	Burn unit- single Hs	53.2% (I)	<u>Crude Mortality:</u> BSI: 21% (20 times higher)	/	/
Brazil	H-W- 11 Hs in one city	14% (P)	/	/	US\$ 18 Mio/year
India	12 ICUs- 6 Hs	4.4% (I)	<u>Extra Mortality:</u> VAP: 19% CVC-BSI: 4% CA-UTI: 11.6%	VAP: 11 CVC-BSI: 5 CA-UTI: 8	/
Malaysia	H-W- single H	13.9% (P)	/	/	Cost x antibiotics x NI: US\$ 521,000/year
Mexico	ICUs	/	/	CVC-BSI: 6	CVC-BSI: US\$ 11,591/case
Turkey	H-W- single H	/	/	HAI gen: 23	HAI gen: US\$ 2026/case
Turkey	H-W- single H	16.6% (I)	/	/	Pneu: US\$ 99/case BSI: US\$ 94/case SSI: US\$ 94/case UTI: US\$ 52/case

Systematic review of the literature conducted by WHO

Conclusions (1)

- The burden of HAI worldwide is likely to be very high and causes prolonged hospital stay, long-term disability, increased resistance of microorganisms to antimicrobials, significant additional financial burden, high costs for patients and their family, and excess deaths
- The lack of a reliable denominator and the use of different definitions and methodologies makes it currently impossible to obtain accurate global estimates
- Some developed countries and facilities succeeded at establishing good surveillance systems, others not yet
- Existent regional networks and national surveillance systems should be strengthened and new ones established

Conclusions (2) – situation in developing countries

- Scattered picture; many countries not represented
- Intra- and inter-continental unbalance (Europe>Americas>South East Asia)
- Most frequent types of studies: hospital-wide prevalence and SSI studies
- Low number of high quality papers (48.2%)
- Lack of information on sample size, proportion of infection diagnosed with microbiological criteria
- Limited information on etiology
- Very limited information about risk factor and impact
- SSI is the most frequent infection site hospital-wide and **SSI rates** are **3-20 fold higher** than in developed countries
- **Hospital-wide** HAI rates do not seem to be particularly higher (2-3 fold) than in developed countries
- **HAI rates in ICU**, particularly device-associated infections, are 3-30 times higher than in the USA

Aiming at... **10 000** registered health-care facilities **by May 2010**

The countdown has started!



Register your facility at <http://www.who.int/gpsc/5may>



World Health
Organization

Patient Safety

A World Alliance for Safer Health Care

SAVE LIVES

Clean Your Hands

Inaugural infection control webinar series

The modern approach to infection control

16 February 2010, 3 pm (CET*)

D. Pittet, Geneva, Switzerland
Lead

First Global Patient Safety Challenge

Clean Care is Safer Care

WHO Patient Safety