**19 October 2017**

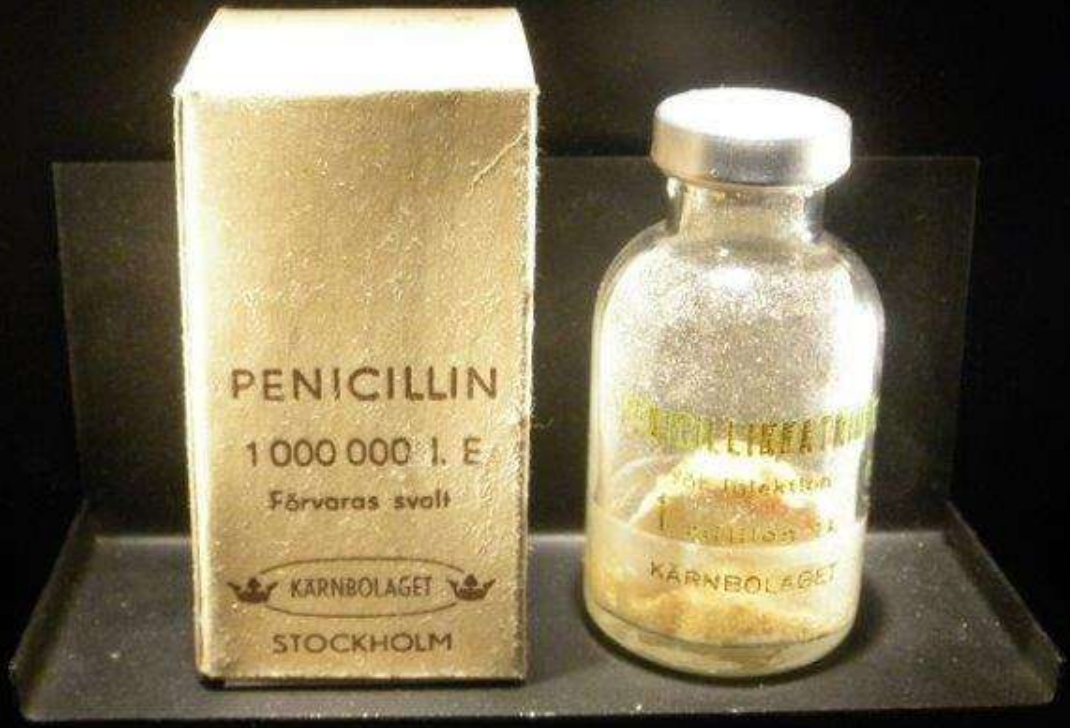
# SAVE antibiotics, SAVE children

## Challenges to tackle antimicrobial resistance

Yoshiaki Gu, MD, MPH, PhD

AMR Clinical Reference Center

National Center for Global Health and Medicine Hospital


PENICILLIN
1 000 000 I. E
Förvaras svalt
KÄRNBOLAGET
STOCKHOLM
KÄRNBOLAGET

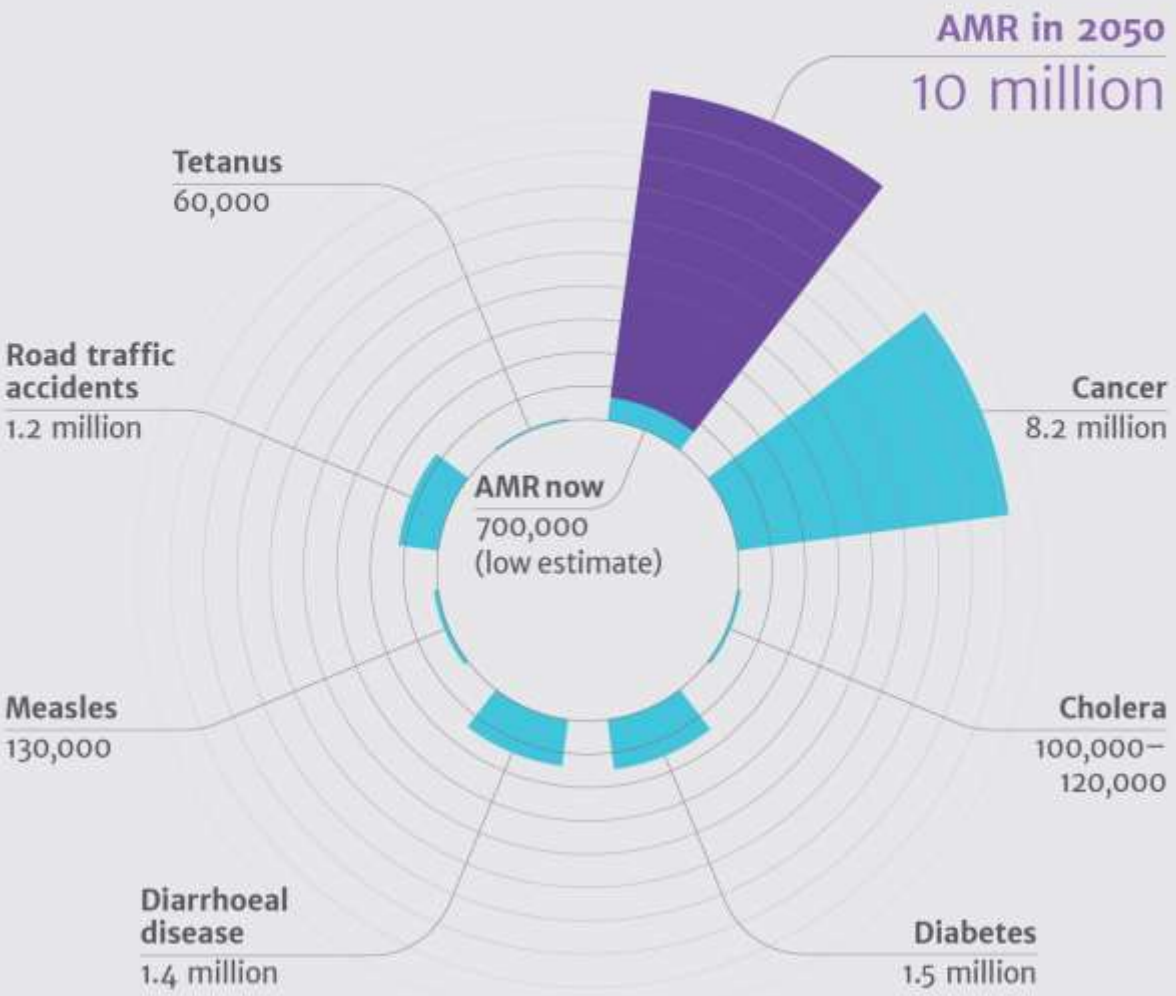
## Alexander Fleming (1881-1955)

It is not difficult to make microbes resistant to penicillin in the laboratory by exposing them to concentrations not sufficient to kill them, and the same thing has occasionally happened in the body.

Nobel Lecture, December 11, 1945

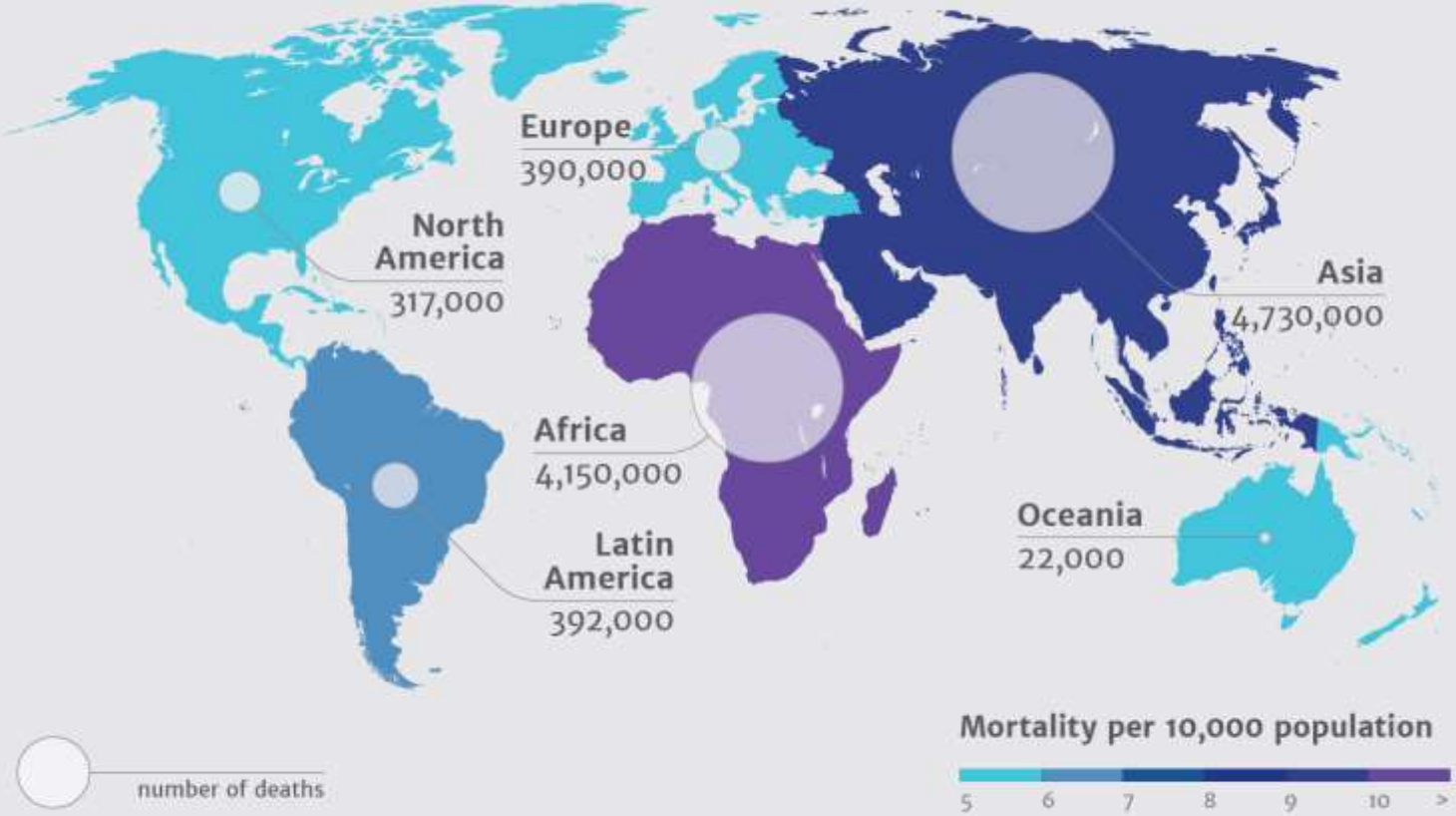
http://www.time.com/time/specials/2007/article/0,28804,1677329_1677708_1677828,00.html

# Deaths attributable to AMR every year
compared to other major causes of death



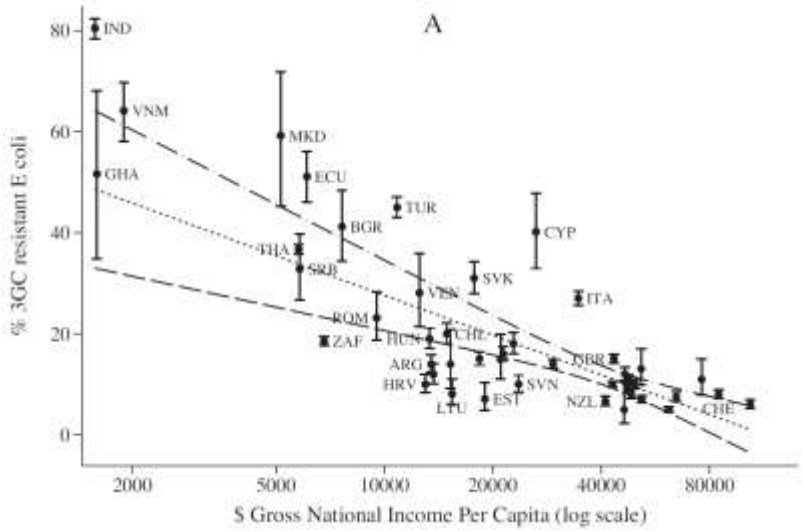

Resistance: Tackling a crisis for the health and wealth of nations
The Review on Antimicrobial Resistance Chaired by Jim O'Neill (December 2014)

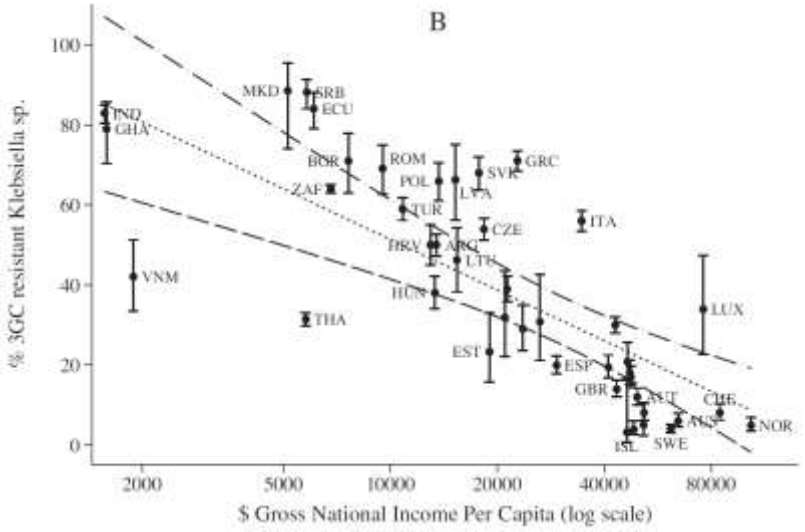
# Deaths attributable to AMR every year
by 2050

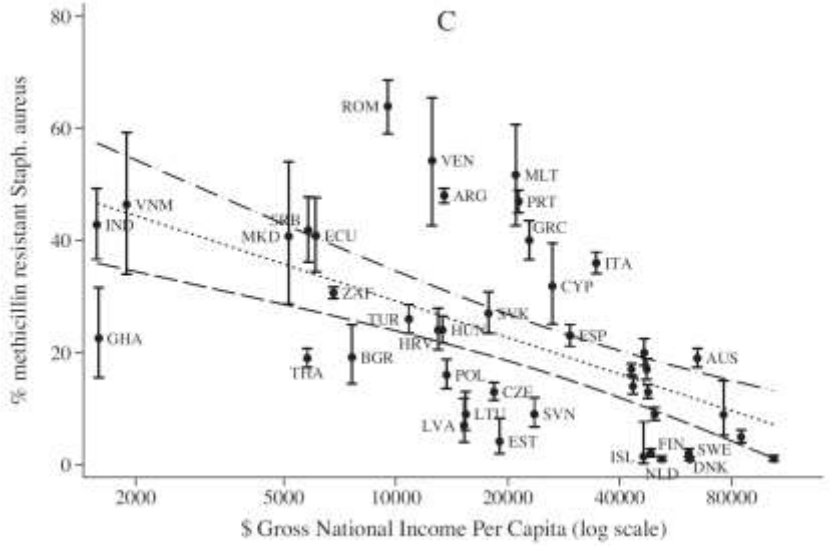



Resistance: Tackling a crisis for the health and wealth of nations
The Review on Antimicrobial Resistance Chaired by Jim O'Neill (December 2014)

# Gross National Income and Resistance




| | |
|---|---|
| 3GC resistant *E. coli* | 3GC resistant *Klebsiella* sp. |
| MRSA | |

Alvarez-Uria G et al. Int J Infect Dis. 2016;52:59–61.

# COMBAT DRUG RESISTANCE

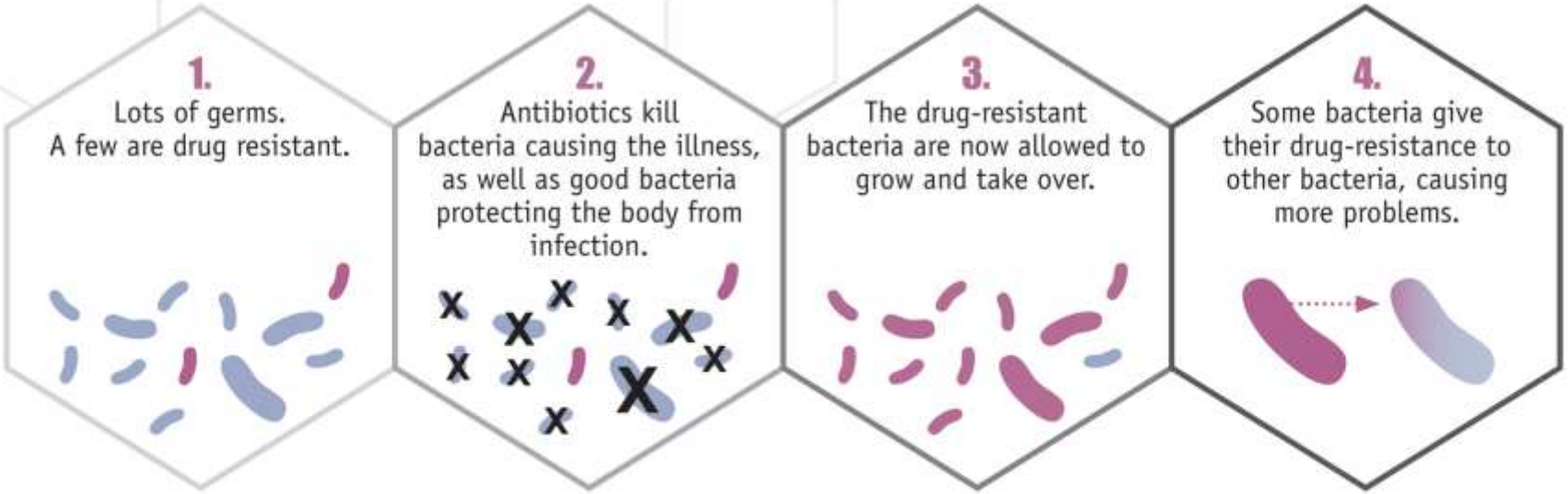

## No action today, no cure tomorrow

7 APRIL 2011 **WORLD HEALTH DAY**

World Health Organization

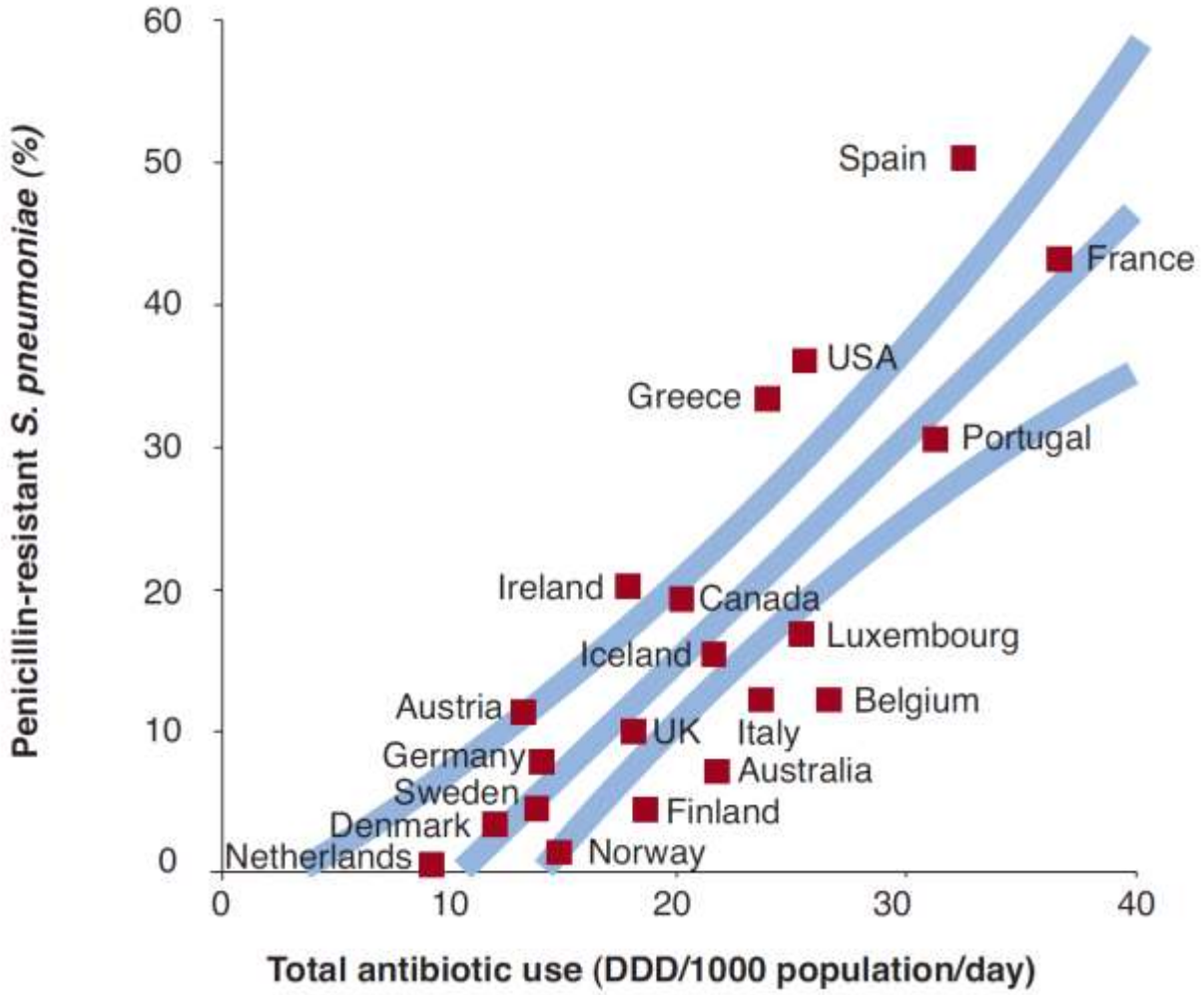
# Antibiotic Use in Medical Care

# How Antibiotic Resistance Happens




CDC

# Antibiotic use and AMR from 1990-2000 in selected countries

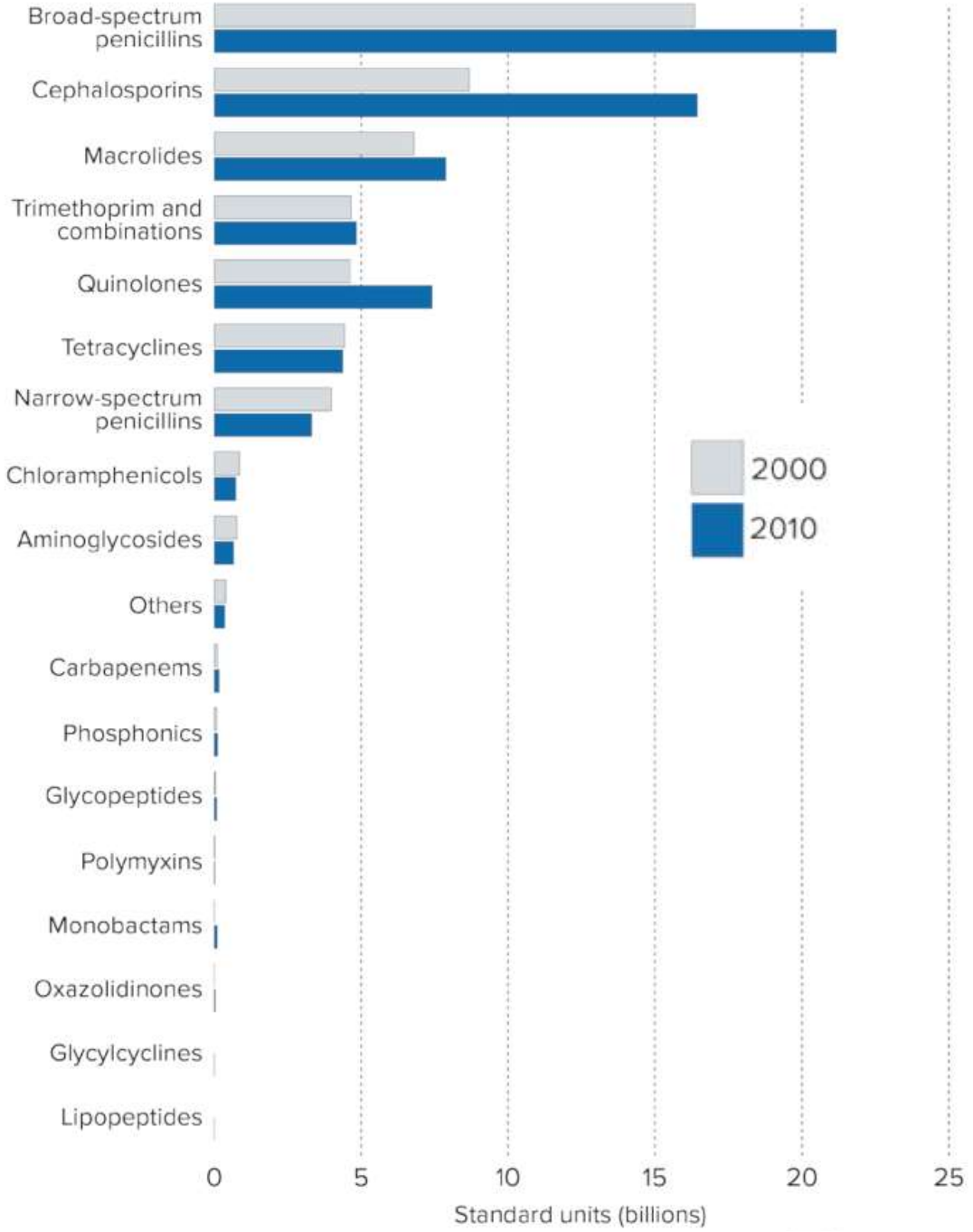



WHO: The evolving threat of antimicrobial resistance, Options for action (2012)

**The more antibiotics,**

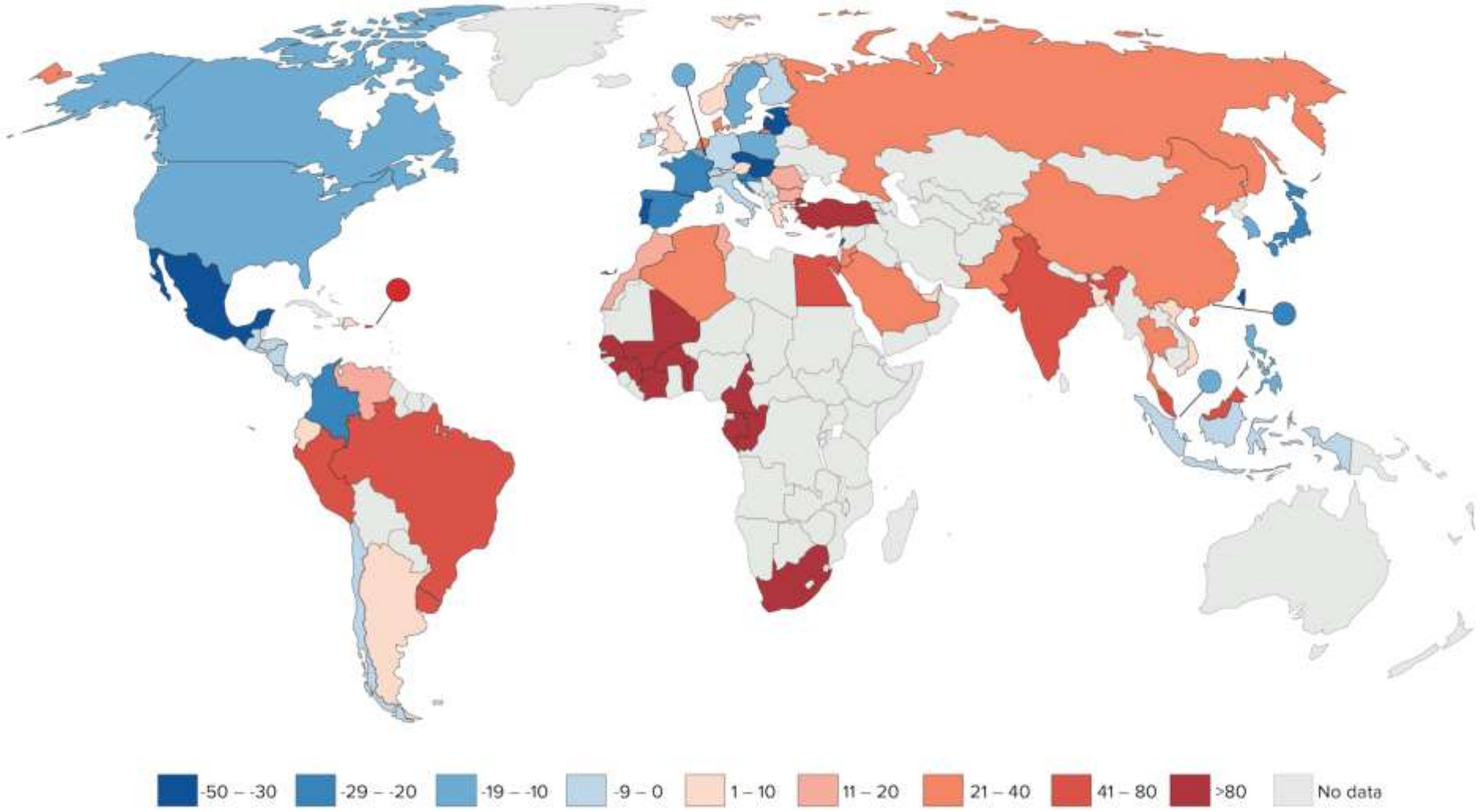
**the more resistant bacteria.**

# Global antibiotic use by class, 2000-2010



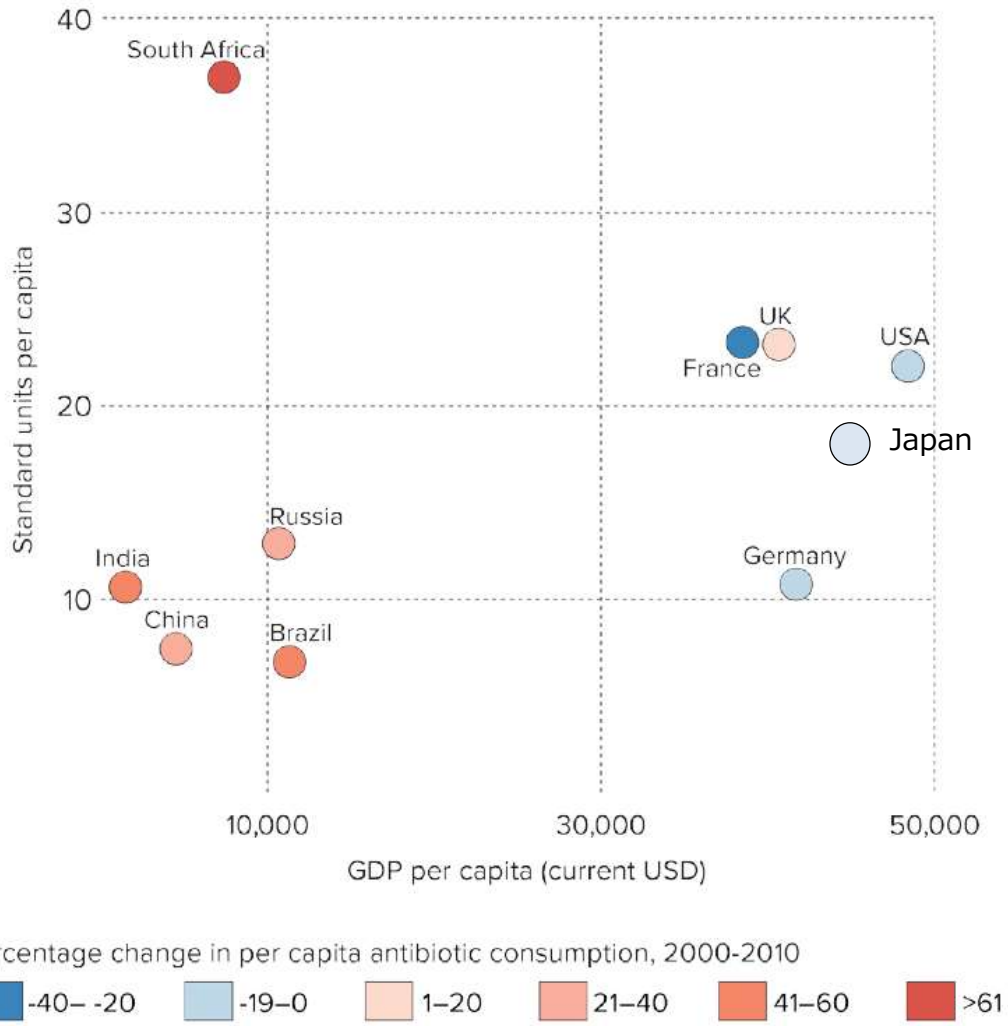

State of the World's Antibiotics, 2015.
CDDEP: Washington, D.C.

# Percentage change in antibiotic consumption per capita 2000–2010, by country



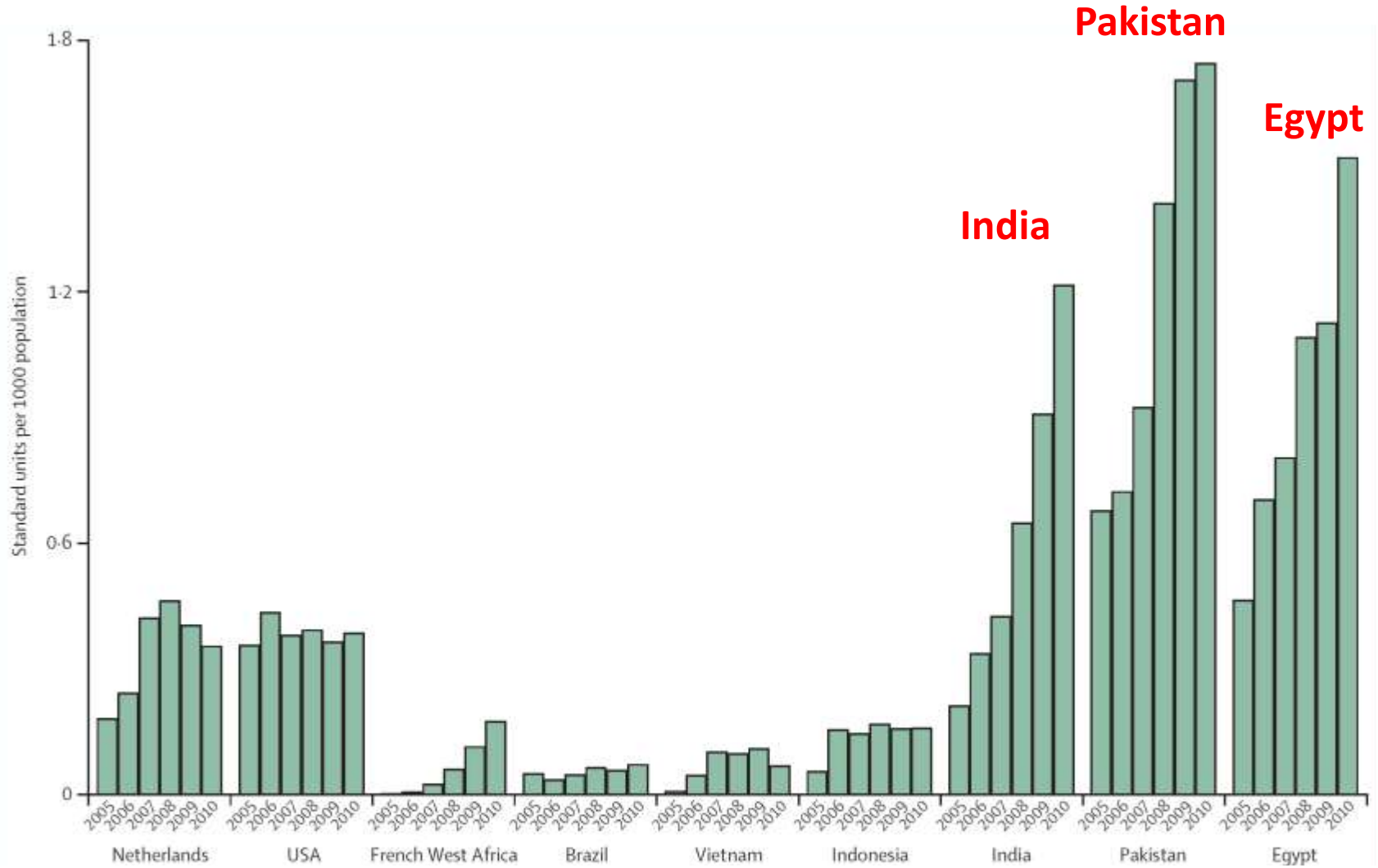

State of the World's Antibiotics, 2015. CDDEP: Washington, D.C.

# Gross Domestic Product and Antibiotic use



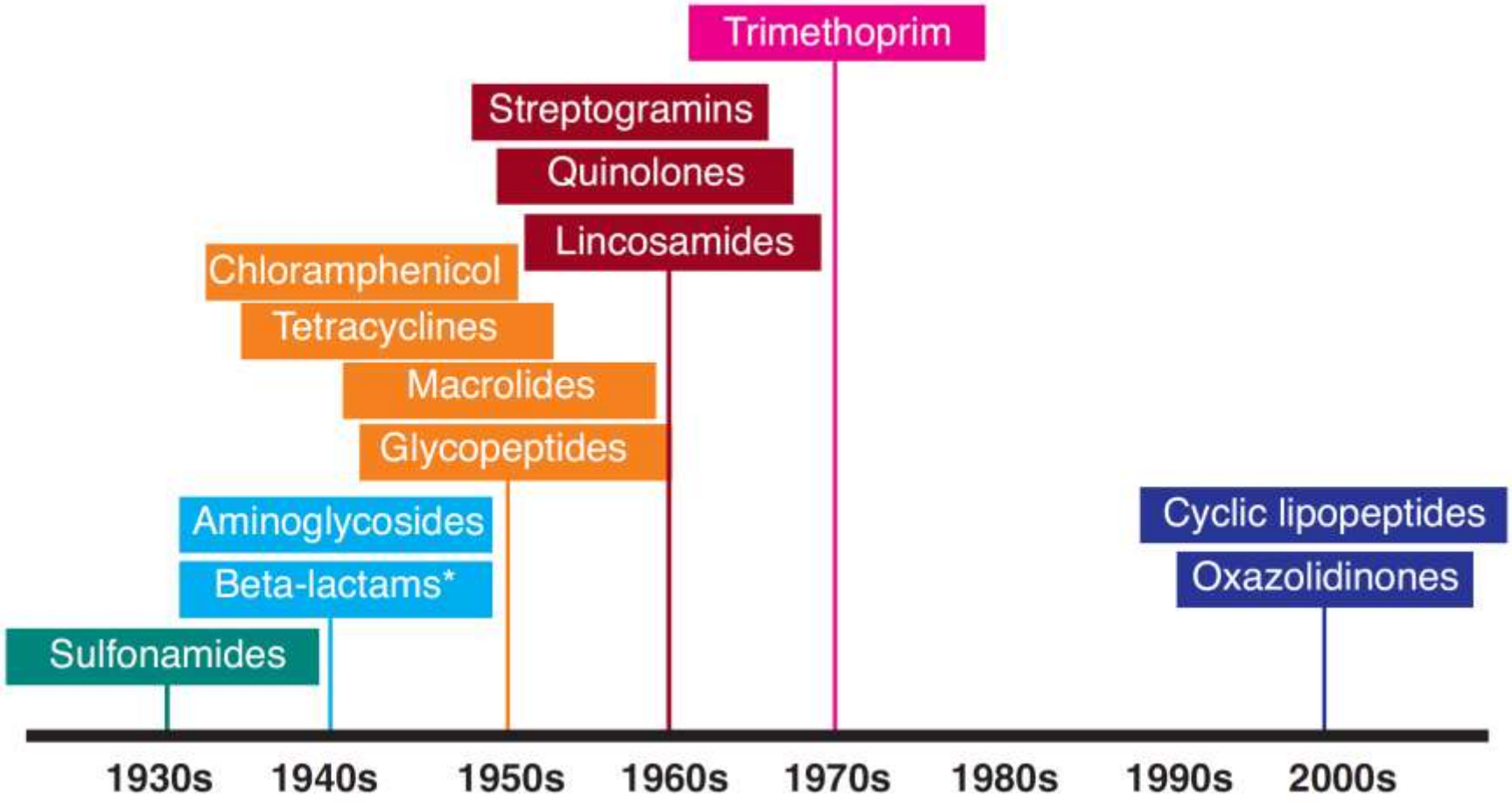

Source: Van Boeckel et al. 2014 (based on IMS MIDAS) and World Bank 2015
The Center for Disease Dynamics, Economics & Policy (CDDEP): “The State of the World’s Antibiotics 2015”

# Carbapenem retail sales in selected countries, 2005–2010 (per 1,000 population)




Lancet Infect Dis 2013;13:1057-98

# Antibiotic pipeline




WHO “The evolving threat of antimicrobial resistance Options for action” (2012)

HEALTH

# India's war against over-the-counter antibiotic abuse

*By Dr Philip Mathew | June 06, 2017*

2017/6/6

http://www.theweek.in/features/lifestyle/India-war-against-over-the-counter-antibiotic-abuse.html

OPINION

# World Health Day 2017: India's Crumbling Healthcare System

The Logical Indian Crew

April 7th, 2017

3.1k
SHARES

2017/4/7

https://thelogicalindian.com/story-feed/opinion/world-health-day-2017/

# Antibiotic Use in Livestock

# ESBL Detection Case in Chicken Meat

(Chicken meat purchased at a store in Kanagawa Prefecture)

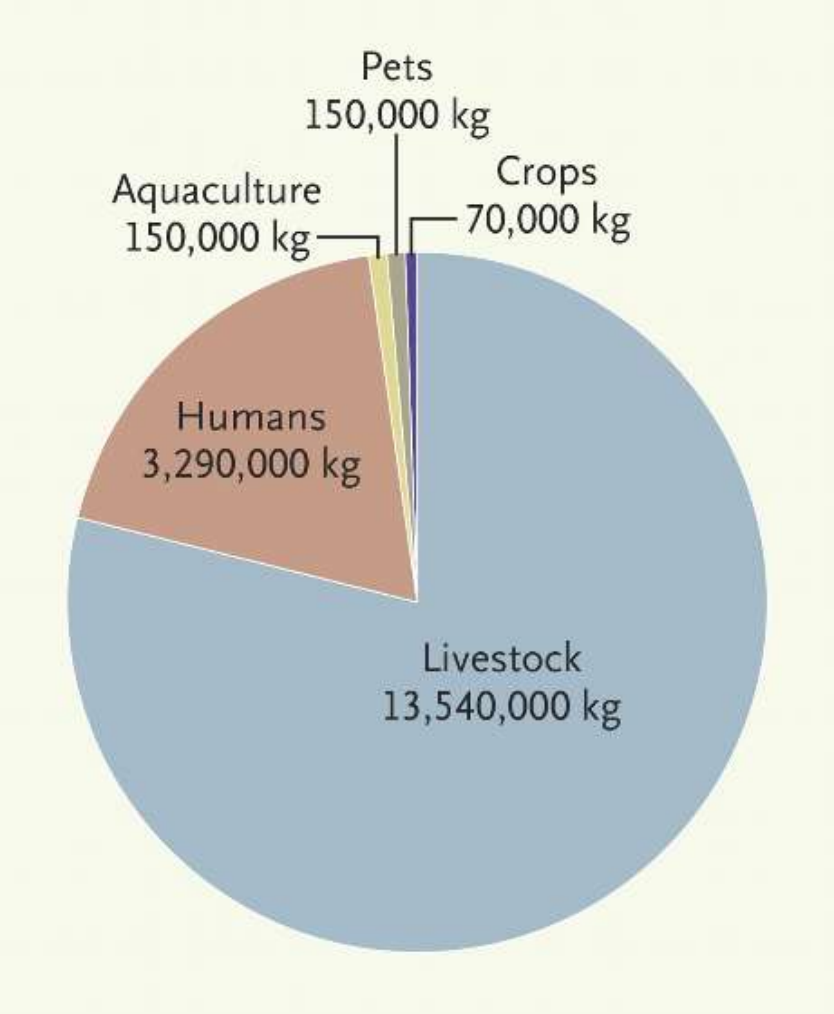
| ESBL-producing bacteria | Ratio of detection |
|---|---|
| **34 samples of domestic minced chicken** | |
| ESBL-producing *E. coli* only | 9 |
| ESBL-producing *E. coli* + ESBL-producing *P. mirabilis* | 4 |
| ESBL-producing *P. mirabilis* only | 4 |
| **Total** | **17 (50.0%)** |

**Not detected in 10 samples of domestic pork**

**Not detected in 6 samples of domestic beef**

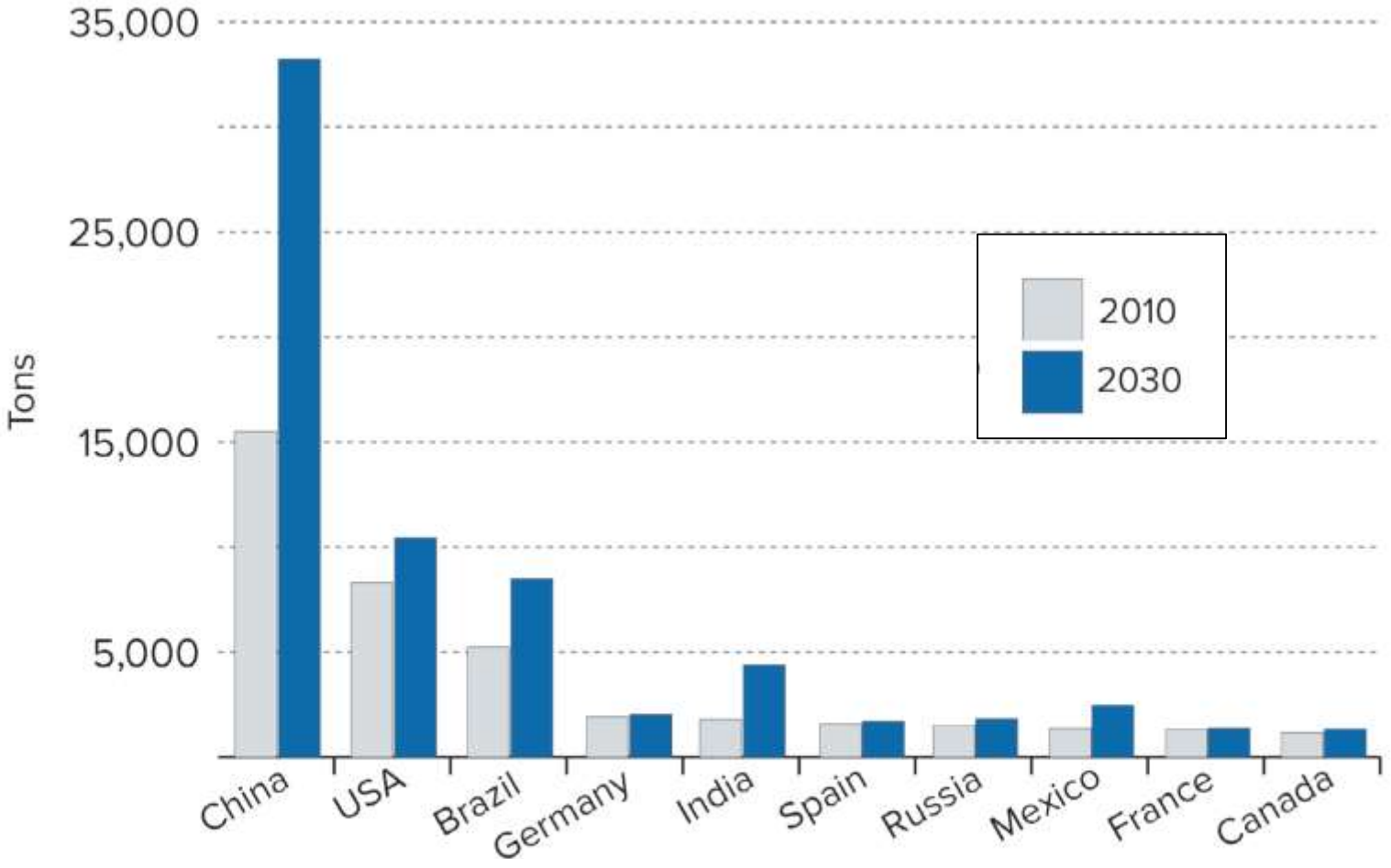
**Japanese Society of Food Microbiology 28: 123-127, 2011**

# Estimated Annual Antibiotic Use in the United States.




N Engl J Med 2013; 369:2474-2476

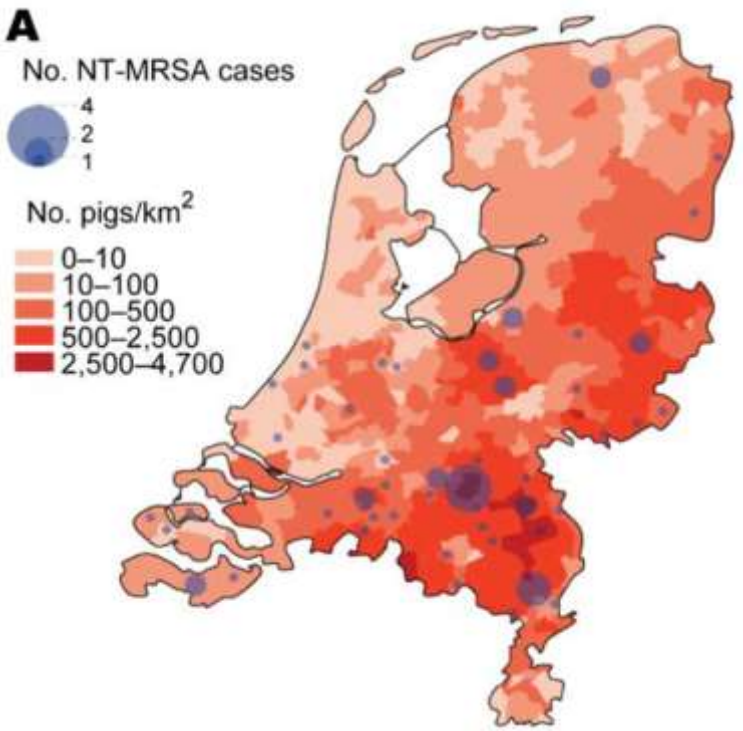
# Antibiotic consumption in livestock, ten top countries 2010-2030




State of the World's Antibiotics, 2015. CDDEP: Washington, D.C.

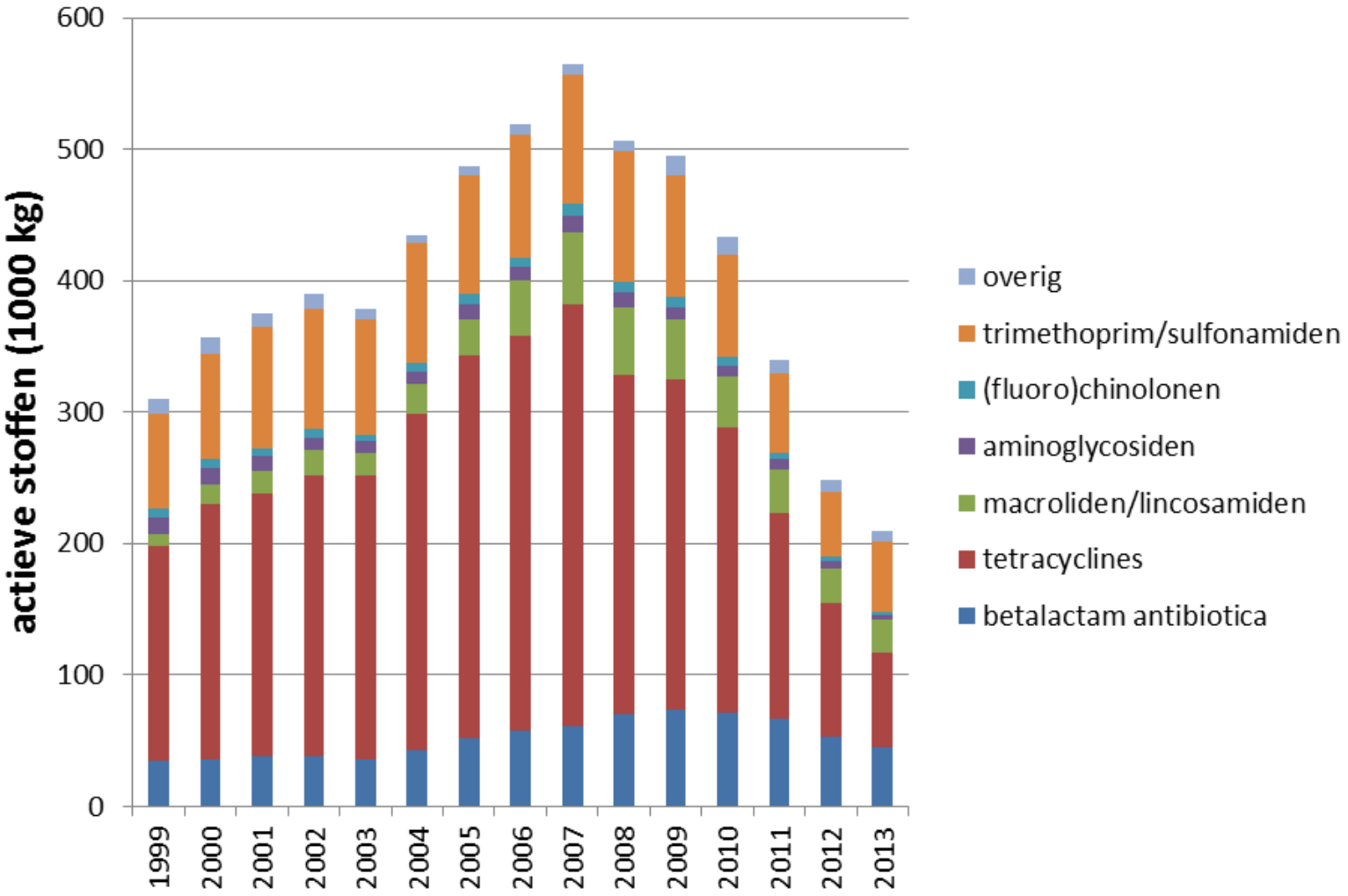
# Emergence of Methicillin-Resistant *Staphylococcus aureus* of Animal Origin in Humans

Inge van Loo,*[1] Xander Huijsdens,†[1] Edine Tiemersma,† Albert de Neeling,†
Nienke van de Sande-Bruinsma,† Desiree Beaujean,† Andreas Voss,‡ and Jan Kluytmans§¶




Emerging Infectious Diseases. 2007;13:1834-1839

# Results of Public Private Collaboration in Reduction in Usage of Antimicrobials in Animals




THE NETHERLANDS VETERINARY MEDICINES AUTHORITY, Hetty van Beers (2014)

# Resistant bacteria in environment

Regional Agenda | India | Innovation | Development

# India plans to install 75 million toilets by 2019, with a little help from Bill Gates


In 2012, the Gates Foundation issued a challenge to design a revolutionary toilet that was safe, sustainable, and affordable. Image: REUTERS/Ruben Sprich

This article is published in collaboration with Business Insider

11 May 2017

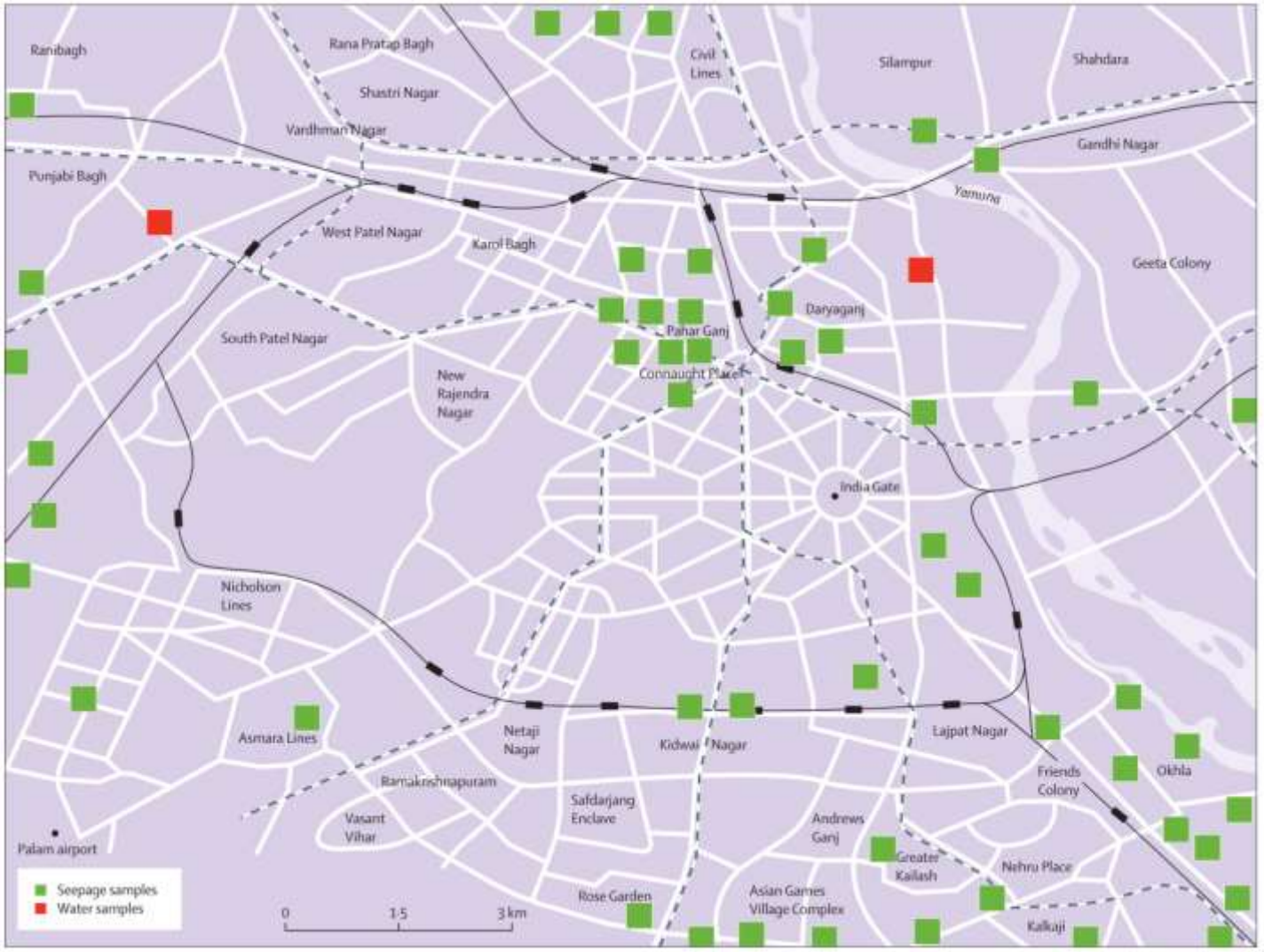
October, 2, 2019 is an important date for India's government.

Coinciding with the 150th anniversary of Mahatma Gandhi's birth, it marks the proposed finish line for "Clean India," the country's ambitious plan to install 75 million toilets around the country.

2017/5/11

https://www.weforum.org/agenda/2017/05/bill-gates-is-helping-india-win-its-war-on-human-waste-heres-how

# Dissemination of NDM-1 positive bacteria in the New Delhi environment




Walsh TR et al. Lancet Infect Dis. 2011;11:355-62.

RESEARCH ARTICLE Open Access

# High colonization rates of extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* in Swiss Travellers to South Asia– a prospective observational multicentre cohort study looking at epidemiology, microb

Esther Kuenzli[1,2*], Veronika K Jaeger[2,3], Reno Frei[4], Johannes Blum[2], Andreas F Widmer[1], Hansjakob F and Christoph Hatz[2,5]

# Antimicrobials Increase Travelers' Risk of Colonization by Extended-Spectrum Betalactamase-Producing *Enterobacteriaceae*

[3] Sari H. Pakkanen,[3] Jukka Ollgren,[6] Jenni Antikainen,[5]

Diseases, Department of Medicine, Helsinki University Hospital, and el Clinic, Medical Centre Aava, [5]Department of Clinical Microbiology, lealth and Welfare, Helsinki, Finland

RESEARCH

# Extended-Spectrum β-Lactamase–producing *Enterobacteriaceae* among Travelers from the Netherlands

Sunita Paltansing, Jes
Alex

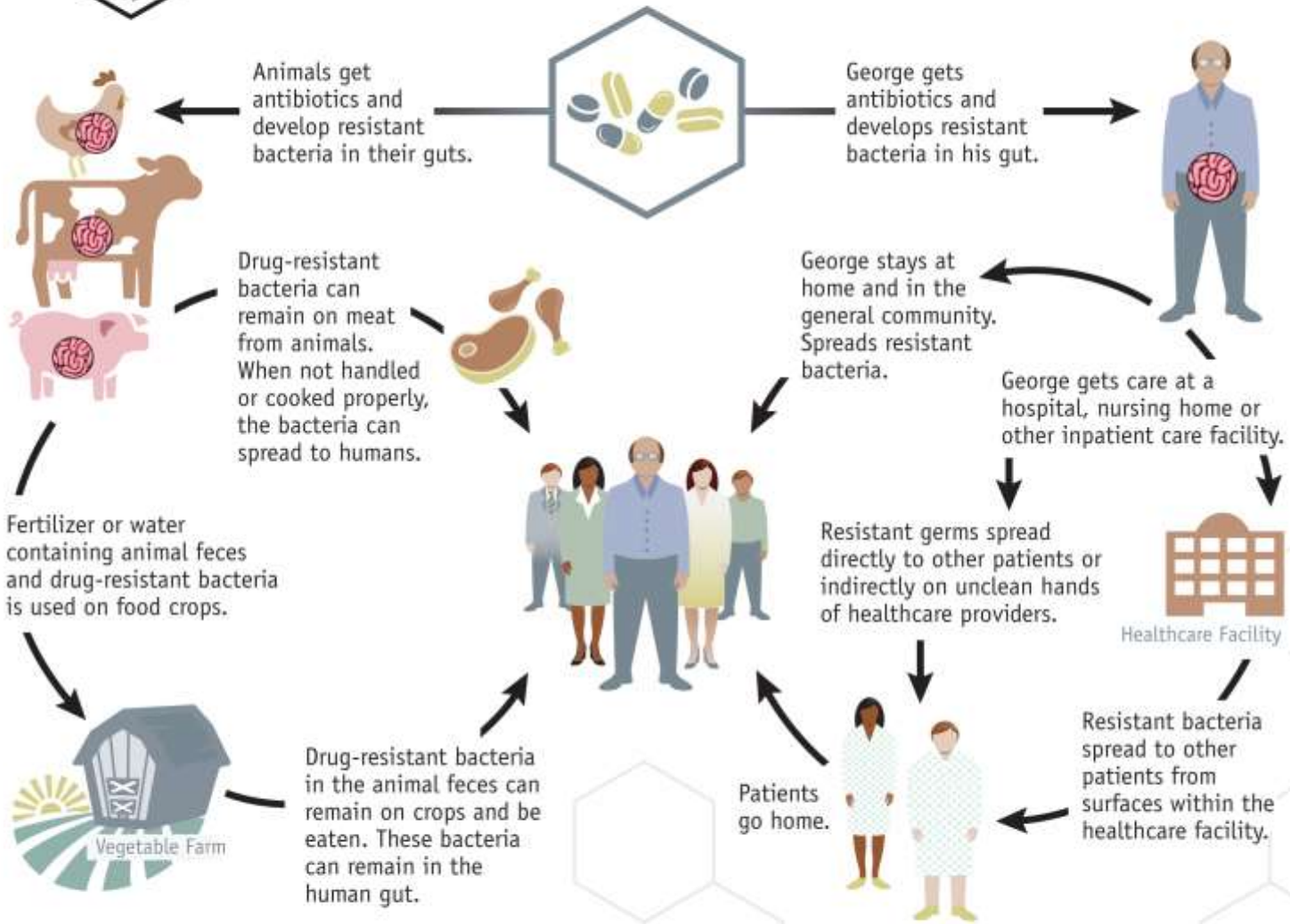
ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Sept. 2010, p. 3564–3568 Vol. 54, No. 9
0066-4804/10/$12.00 doi:10.1128/AAC.00220-10


# Foreign Travel Is a Major Risk Factor for Colonization with *Escherichia coli* Producing CTX-M-Type Extended-Spectrum β-Lactamases: a Prospective Study with Swedish Volunteers▽

Thomas Tängdén,[1]* Otto Cars,[1] Åsa Melhus,[2]† and Elisabeth Löwdin[1]†

*Sections of Infectious Diseases[1] and Clinical Bacteriology,[2] Department of Medical Sciences, Uppsala University, Uppsala, Sweden*

# Examples of How Antibiotic Resistance Spreads




**Simply using antibiotics creates resistance. These drugs should only be used to treat infections.**

CDC

# CAUSES OF ANTIBIOTIC RESISTANCE

HANDLE ANTIBIOTICS WITH CARE

**Antibiotic resistance** happens when bacteria change and become resistant to the antibiotics used to treat the infections they cause.

Over-prescribing of antibiotics

Patients not finishing their treatment

Over-use of antibiotics in livestock and fish farming

Poor infection control in hospitals and clinics

Lack of hygiene and poor sanitation

Lack of new antibiotics being developed

---

www.who.int/drugresistance

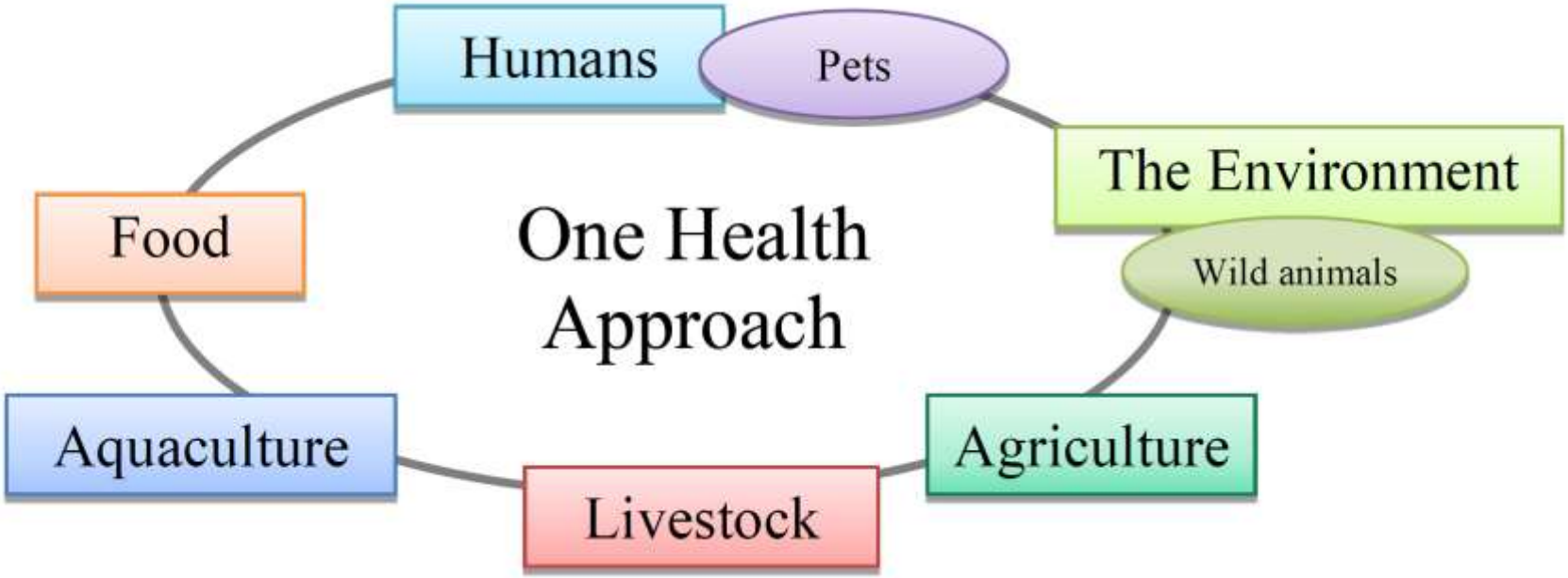
#AntibioticResistance

World Health Organization


GLOBAL ACTION PLAN
ON ANTIMICROBIAL
RESISTANCE
World Health
Organization

2015

# Collaboration under One Health Approach




National Action Plan on Antimicrobial resistance (AMR) 2016-2020

# Antimicrobial stewardship

# Antimicrobial (Antibiotic) stewardship

- Coordinated interventions to improve and measure appropriate use of antibiotics
  - by promoting the selection of the optimal antibiotic drug regimen
  - dosing, duration of therapy, route of administration


Implementing an Antibiotic Stewardship Program: Guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. 2016

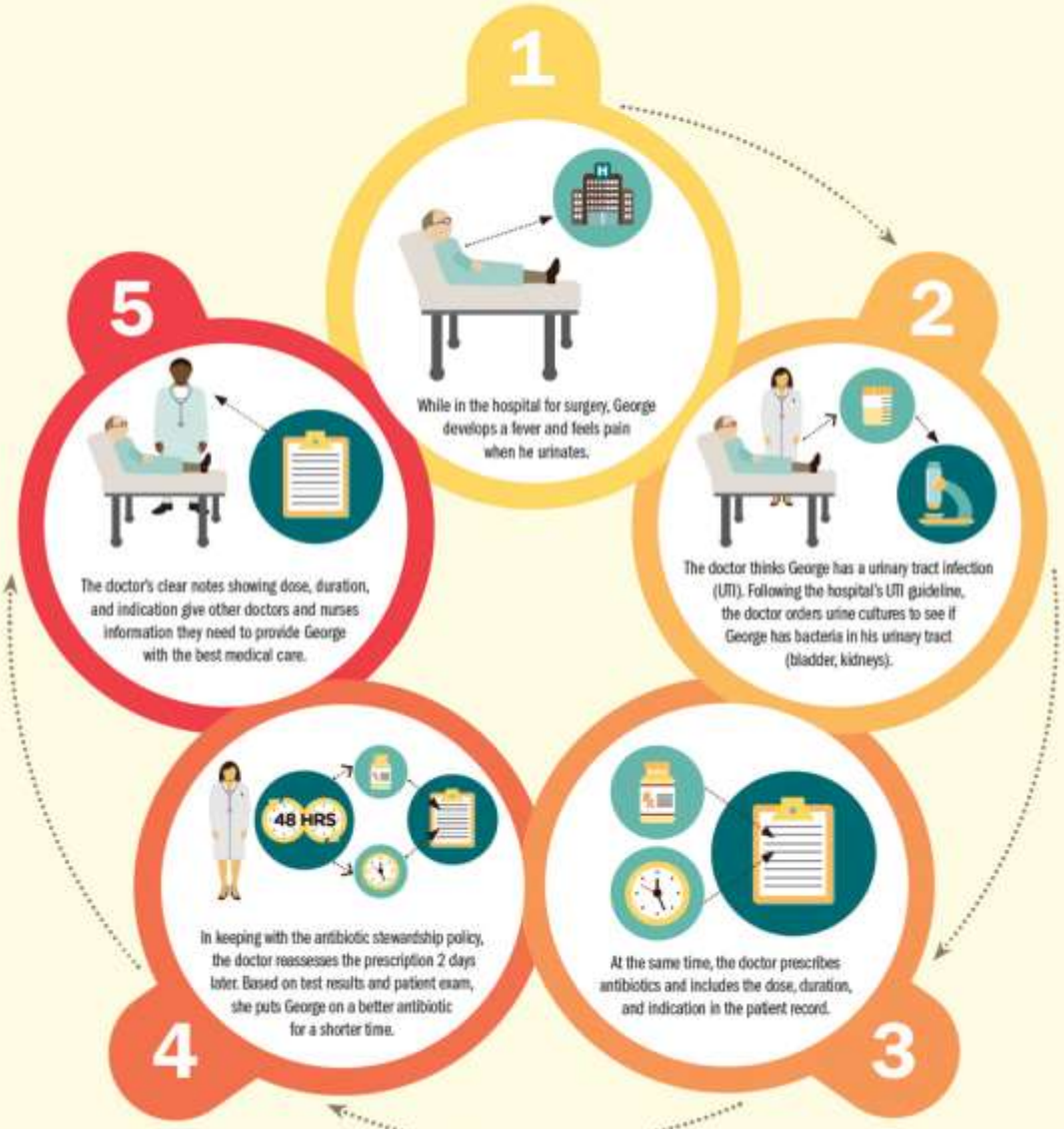
# ANTIBIOTIC STEWARDSHIP PROGRAM Intervention

- Preauthorization, Prospective Audit & Feedback
- Prescriber-Led Review (antibiotic time-outs, stop orders)
- Facility-Specific Clinical Practice Guidelines for Common Infectious Diseases
- Target Patients With Specific Infectious Diseases Syndromes
- Computerized clinical decision support

IDSA, Guideline for Implementing an Antibiotic Stewardship Program

# Improving antibiotic prescribing in hospitals

Key moments for improving the cycle of antibiotic prescribing practices

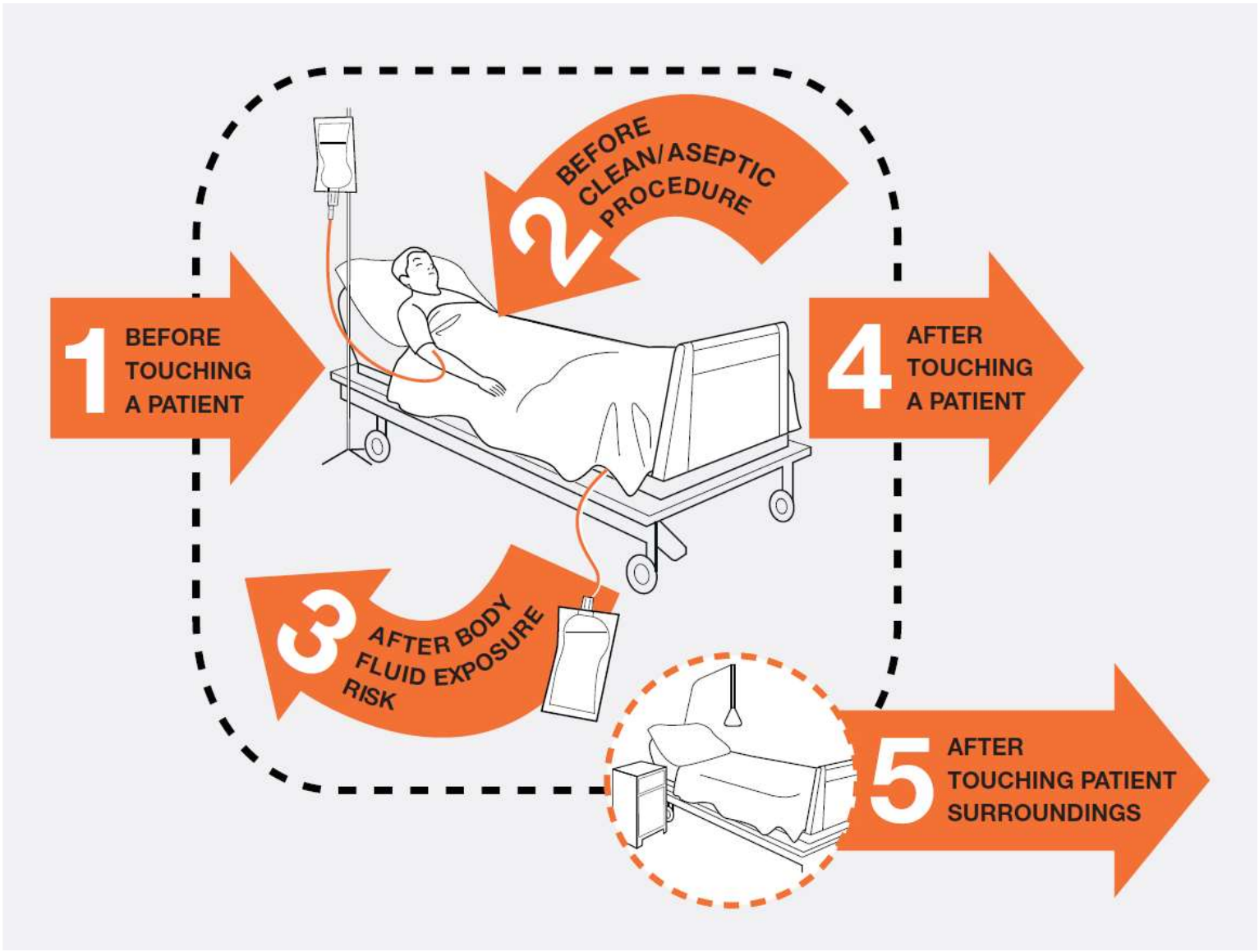



SOURCE: CDC Vital Signs, 2014

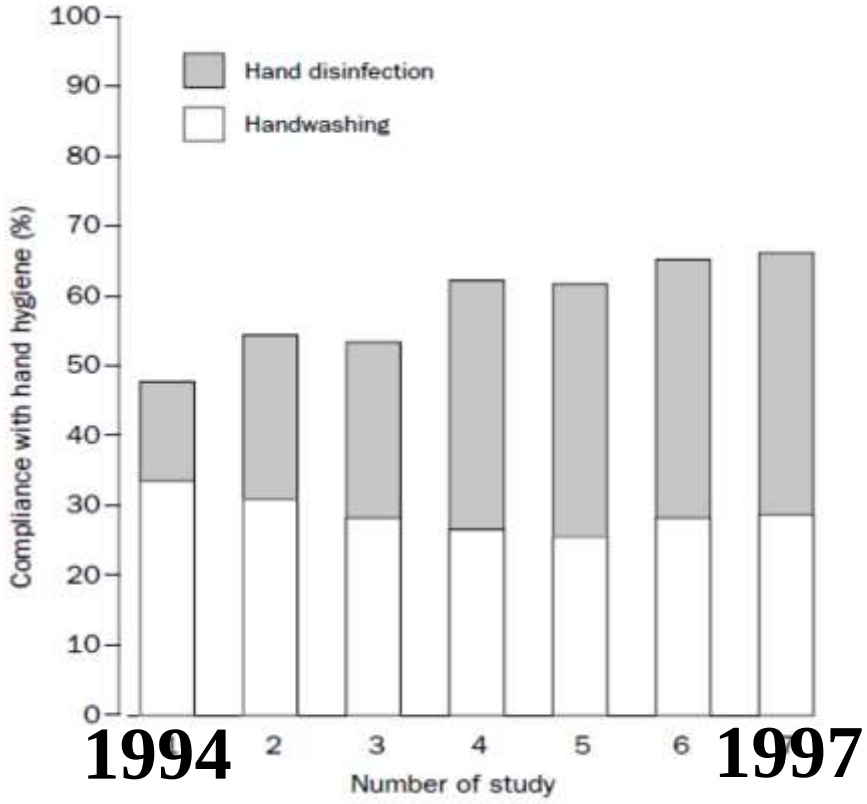
# Infection prevention and control

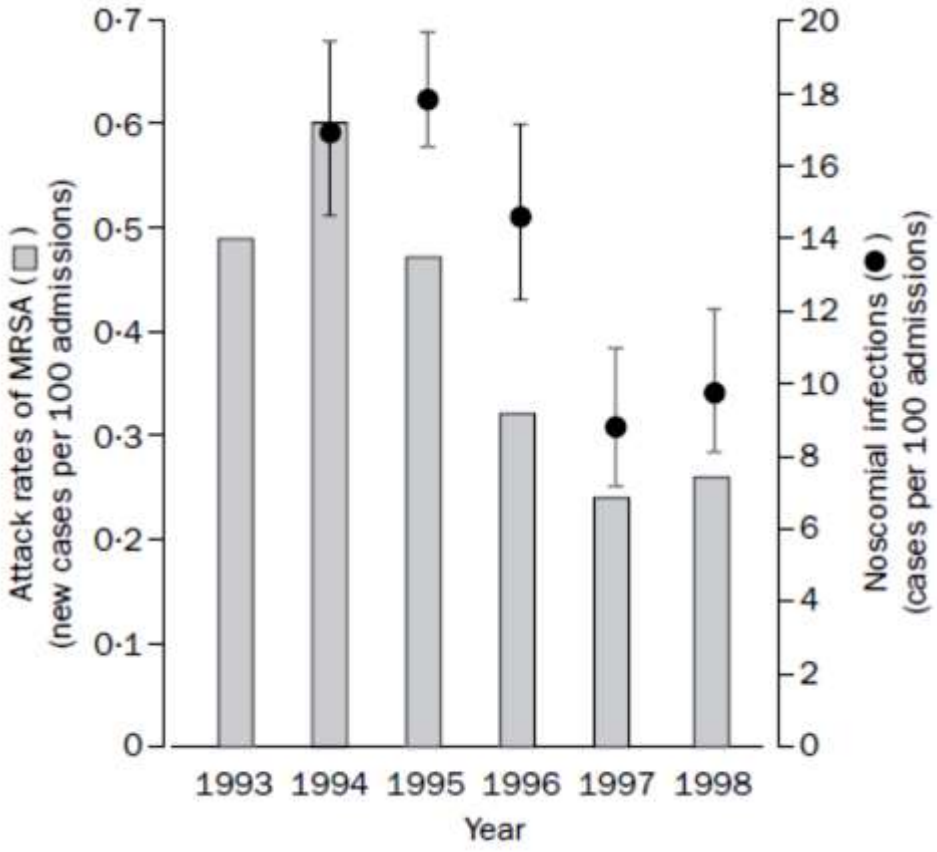
# Standard and Isolation Precautions

# WHO campaign for hand hygiene



# Hand hygiene can decrease nosocomial infections

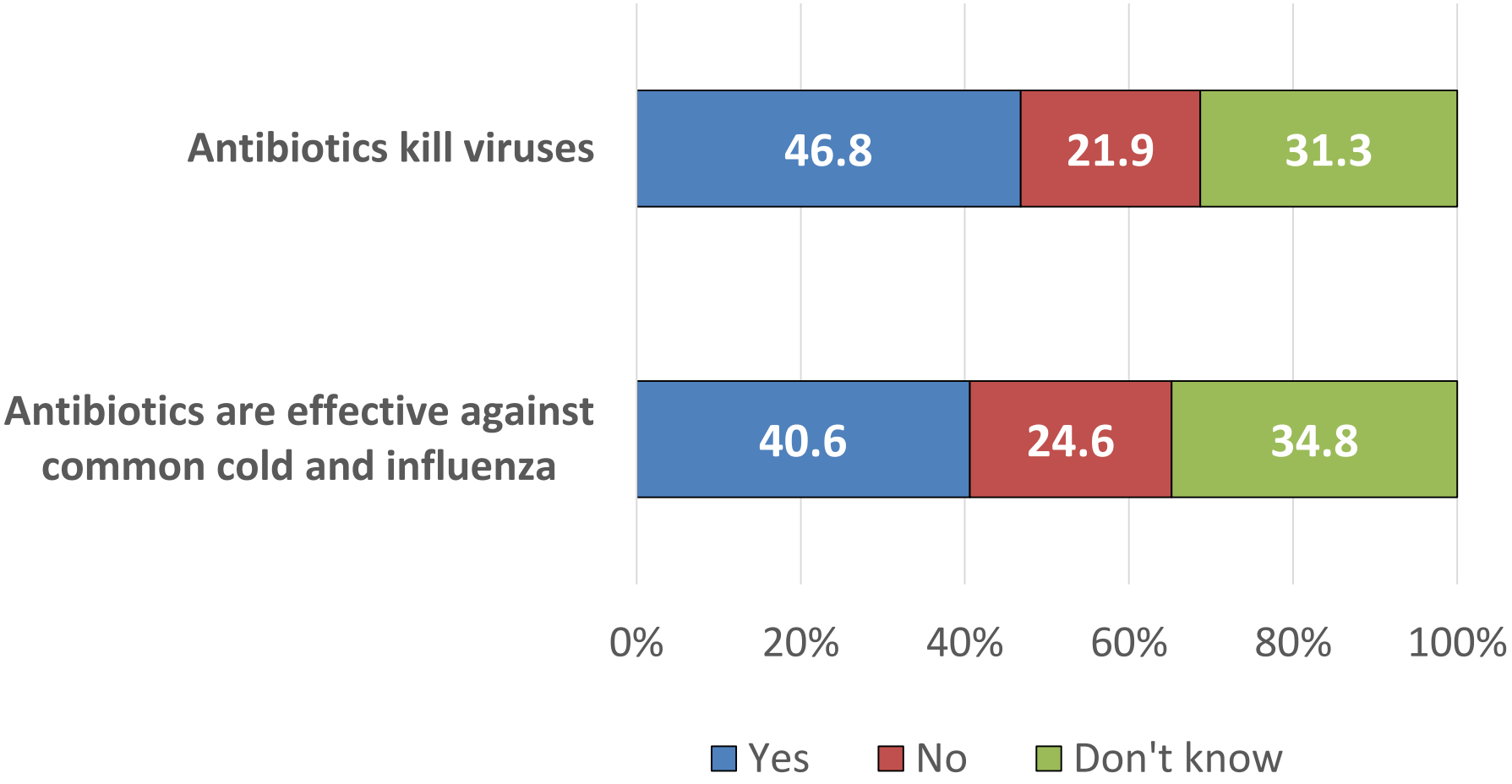



Lancet 2000; 356: 1307-12.

# Civic Education

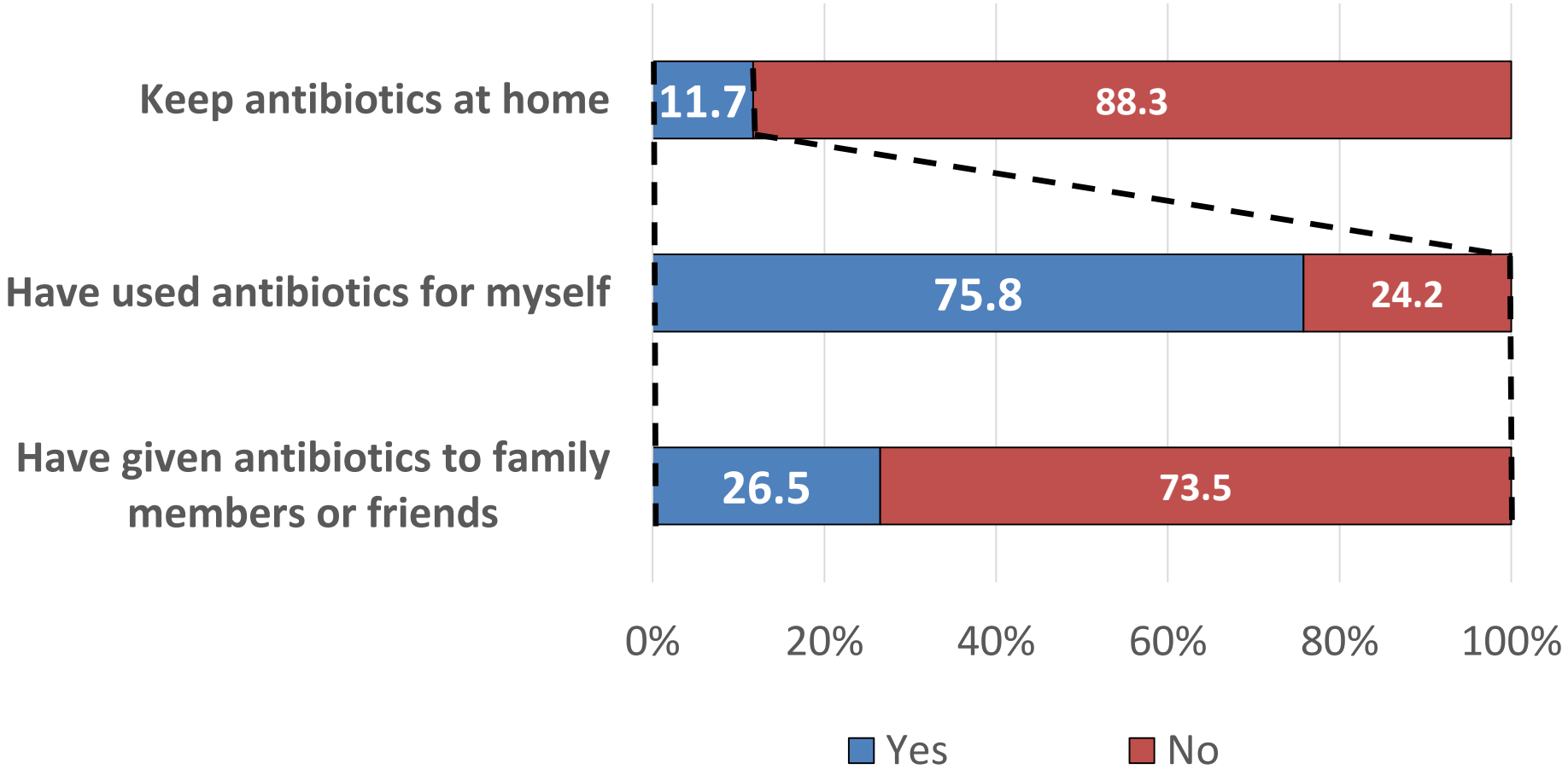
# Public awareness about antibiotics in Japan
## (internet survey, Mar 2017)




厚生労働科学研究費補助金平成28年度分担研究　医療機関等における薬剤耐性菌の感染制御に関する研究
「国民の薬剤耐性に関する意識についての研究」

# Public awareness about antibiotics in Japan

## (internet survey, Mar 2017)

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「国民の薬剤耐性に関する意識についての研究」

# National Action Plan on Antimicrobial Resistance (AMR)

**2016-2020**

**April 5, 2016**

**The Government of Japan**

| | Field |
|---|---|
| 1 | Public awareness/education |
| 2 | Surveillance/monitoring |
| 3 | Infection prevention/control |
| 4 | Proper use of antimicrobial agents |
| 5 | Research & development/drug development |
| 6 | International cooperation |

National Action Plan on Antimicrobial resistance (AMR) 2016-2020

# Numeral targets

| Proportion of resistant isolates of specific indicator microorganisms | | | |
|---|---|---|---|
| | **Indicator** | **2014** | **2020 (target)** |
| Human | Proportion of penicillin-resistance in *Streptococcus pneumoniae* | 48% | **15% or less** |
| | Proportion of fluoroquinolone resistance in *Escherichia coli* | 45% | **25% or less** |
| | Proportion of methicillin resistance in *Staphylococcus aureus* | 51% | **20% or less** |
| | Proportion of carbapenem resistance in *Pseudomonas aeruginosa* | 17% | **10% or less** |
| | Proportion of carbapenem resistance in *Escherichia coli/Klebsiella pneumoniae* | 0.1-0.2% | **0.2% or less** (same level as of 2014) |

National Action Plan on Antimicrobial resistance (AMR) 2016-2020

# Numeral targets

| Antimicrobial Use for humans (average amount of antimicrobials used per day per 1,000 population) | | |
|---|---|---|
| **Index** | **2014** | **2020 (target)** |
| Total | 15.8 | **Decreased by 33%** |
| Oral cephalosporins, fluoroquinolones, macrolides | 11.6 | **Decreased by 50%** |
| Intravenous antimicrobials | 1.2 | **Decreased by 20%** |

National Action Plan on Antimicrobial resistance (AMR) 2016-2020

# AMR Clinical Reference Center

- Established in National Center for Global Health and Medicine Hospital in April 2017
- Working on projects and researches based on National Action Plan on Antimicrobial Resistance in Japan
  - Clinical Surveillance Division
  - Information and Education Division

NCGM

AMR Clinical Reference Center

AMR Clinical Reference Center

# Clinical Surveillance Division

- System development for surveillance on Healthcare Associated Infection (HAI)
- System development for surveillance on Antimicrobial Usage (AMU)
- Development of indicators for proper use of antimicrobials and establishment of surveillance

NCGM

AMR Clinical Reference Center

AMR Clinical Reference Center

# Information and Education Division

- Creating materials and making PR campaign for raising awareness
  - For general public, health care workers and public health officials
- Creation of guidelines / manuals to support medical practice
- Established consortium for infectious disease education to promote these projects

NCGM

AMR Clinical Reference Center

AMR臨床リファレンスセンター

AMR
Clinical Reference Center
厚生労働省委託事業

かしこく治して、明日につなぐ
～抗菌薬を上手に使ってAMR対策～

サイト内検索 検索

国立国際医療研究センター病院

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## 「私たちができること」

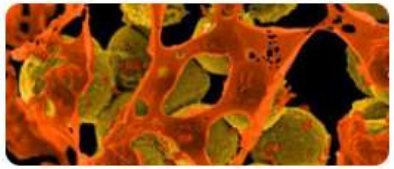
薬剤耐性(AMR)が拡大すると
抗菌薬の効かない感染症が増加し
感染症の予防や治療が難しくなります。
AMRの拡大を防ぐために
私たちができることを考えましょう。

詳しくはこちら ▶

## 一般の方へ

### 感染症の基本

### 薬剤耐性菌について



### 日本の薬剤耐性菌の状況

http://amr.ncgm.go.jp/

# 薬剤耐性とは？

薬剤耐性が生まれるま

❶ 通常時

体の中には様々な
悪のない細菌が
たくさんある。

❸ 薬剤（抗菌薬）治療

病原菌と共に体に悪のない
細菌も退治してしまう

❹ 薬剤耐性菌が残る

わずかにいた薬剤耐性菌が
生き残ったり、病原菌が変化

※いつも薬剤耐性菌に置き換わるわけではありませんが、抗菌薬を使うほ

# 薬剤耐性菌が増えることでの主な影響

薬剤耐性菌

薬剤耐性菌増

薬剤耐性菌が増える
なり、最悪の場合死
また薬剤耐性菌は病
十分な注意が必要で

# 今から出来る６つの薬剤耐性予防

抗菌薬は医師の
処方箋が必要です

抗菌薬は医師の
指示通り飲みきる

抗菌薬をとっておいて
あとで飲まない

抗菌薬を
あげない、もらわない

わからないことは
医師や薬剤師に聞こう

感染症を予防しよう

「かしこく治して、明日につなぐ」

～抗菌薬を上手に使ってＡＭＲ対策～

AMR
Clinical Reference Center

# COMBAT DRUG RESISTANCE


## No action today, no cure tomorrow

7 APRIL 2011 **WORLD HEALTH DAY**

World Health Organization


Thank you!
yogu@hosp.ncgm.go.jp
AMR
Clinical Reference Center