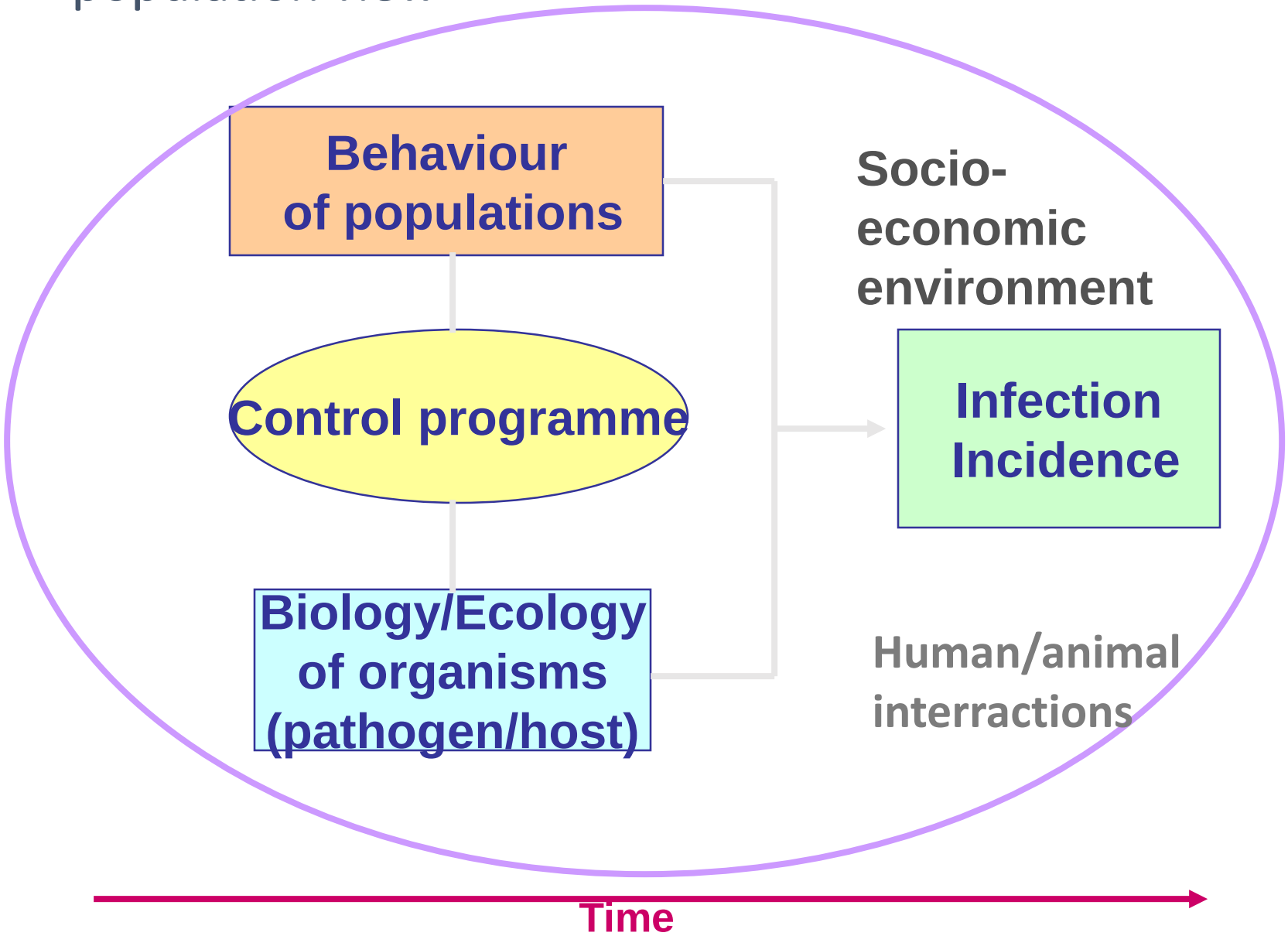
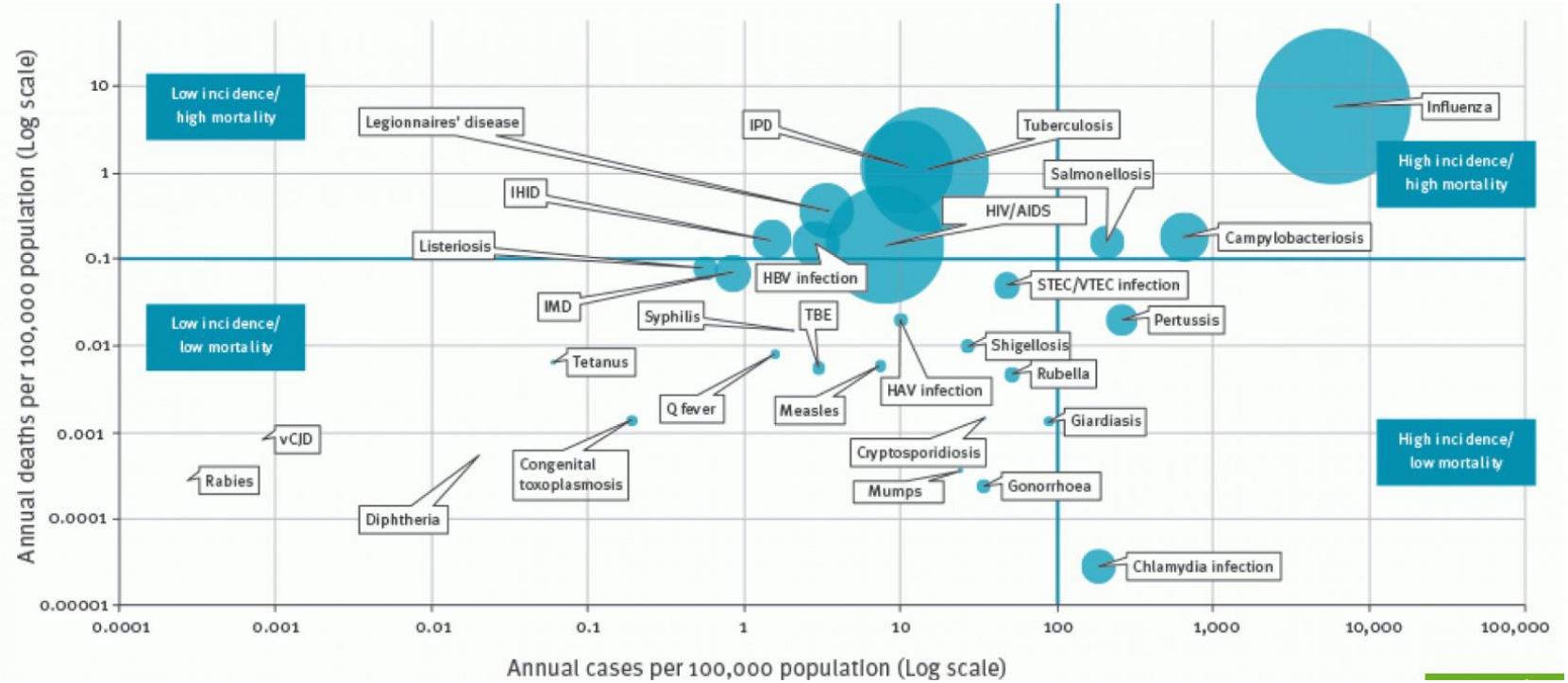
Public Health Resources: Core Capacities to Address the Threat of Communicable Diseases

Anne M Johnson
Professor of Infectious Disease Epidemiology
Ljubljana, 30th Nov 2018

Drivers of infection transmission of infections – a population view

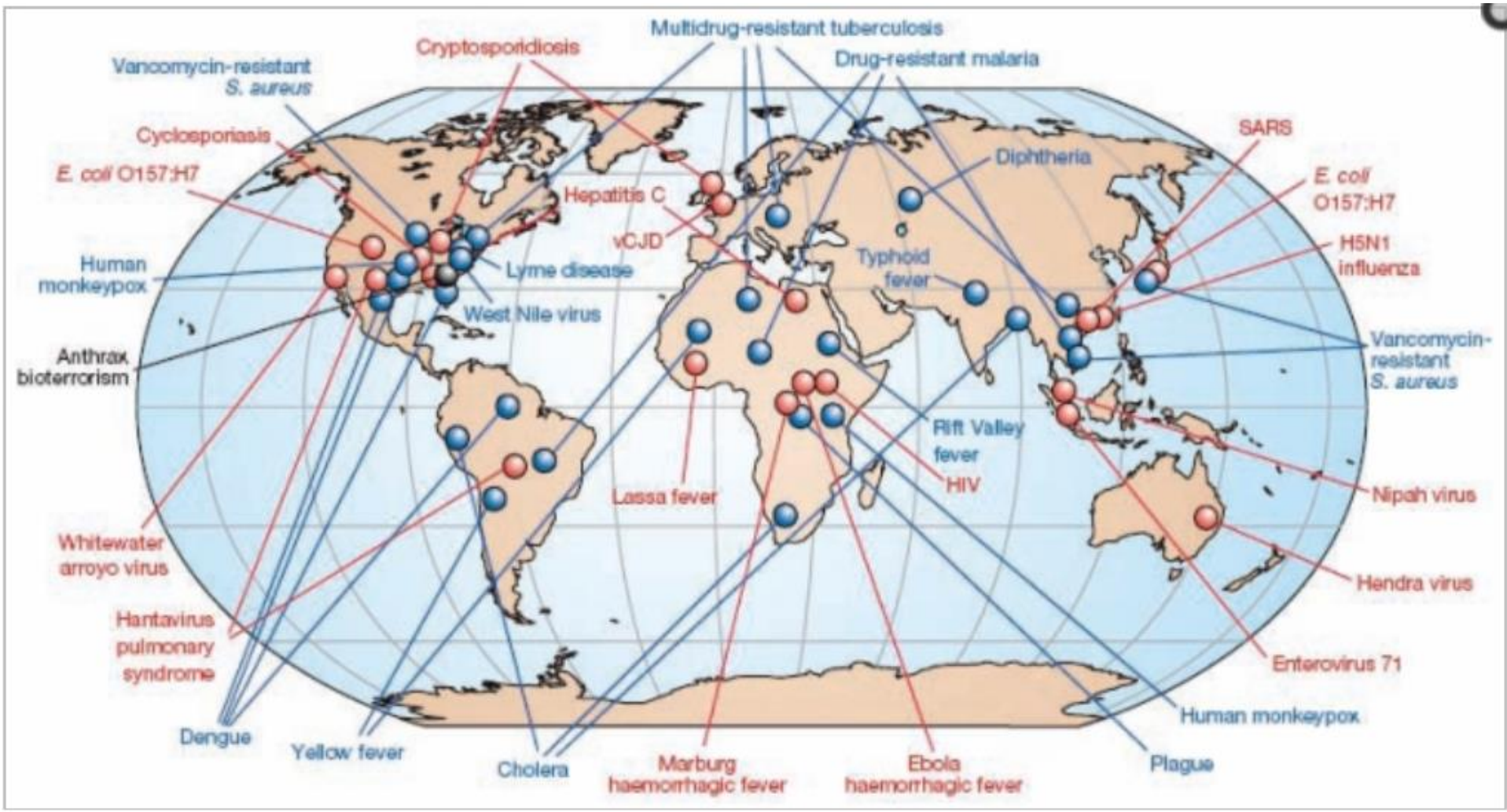


Burden of selected infectious diseases in Europe 2010-2013 , mortality and morbidity



Source: ECDC

Global examples of emerging and re-emerging infectious disease



Source Morens et al 2004

FREE

METRO

Thursday, April 24, 2003 www.metro.co.uk

Toronto shut to tourists by bug

BY SUZANNE STEVENSON

A CITY visited by hundreds of thousands of Britons a year was yesterday declared unsafe after an outbreak of the deadly Sars virus.

The Department of Health said all non-essential travel to Toronto should be scrapped. The Canadian city joins Beijing, Hong Kong and two Chinese provinces on a World Health Organisation list of places to avoid.

Severe acute respiratory syndrome has now killed 251 people in the world, including 16 in Toronto, home to 1.5million British ex-pats. More than 4,000 cases have been reported worldwide.

Canada is the ninth most-visited country in the world with about 700,000 Britons holidaying there each year.

Dr David Heymann, WHO's communicable diseases chief, said the travel warning would last for at least th weeks – double the maximum incuba period for the virus.

Five new cases elsewhere in the w were traced back to Toronto last we prompting the new advice, he added.

However, Toronto mayor Mel Last said the warning could ruin the c tourist trade. "Who did they see? Wh they talk to? This isn't a city in the of fear and panic," he insisted.

In Britain, there have been six case Chief Medical Officer Sir Liam Do son said they were all treated quickl

Expert advice does not recommer mass quarantining of travellers retu from the Far East or Canada,' he ad

Panic in Beijing – Page

DAILY EXPRESS

CRUSADING FOR A SAFER WORLD — The World's Greatest Newspaper — THURSDAY APRIL 24,

SARS WILL KILL MORE THAN AIDS

HOW WE ARE AFFECTED

EXPRESS INVESTIGATION – PAGES 8&9

The Guardian

Behind the mask People protect against virus in Australia, India, Canada and China

Global battle against Sars panic

THE INDEPENDENT

THURSDAY 24 APRIL 2003 www.independent.co.uk

Toronto is put into 'quarantine' over Sars outbreak

BY DAVID USBORNE in New York

TORONTO, THE largest city in Canada, was placed under an unexpected quasi-quarantine yesterday after the World Health Organisation put it on a list of three destinations people should avoid because of severe acute respiratory syndrome.

The advice, issued as the global death toll reached 251, said Toronto, Beijing and the Chinese province of Shanxi were places to avoid because of the risk of catching the virus. The organisation had previously warned against travel to Hong Kong and the Chinese province of Guangdong.

The WHO said it was "recommending, as a measure of precaution, that persons planning to travel to these destinations consider postponing all but essential travel". Toronto is the first non-Asian city singled out by a WHO health advisory.

Toronto, which has a population of four million, has reported 136 cases of Sars and 15 deaths. The disease, which has a 5.9 per cent mortality rate, is thought to have been imported to the city by a Chinese Canadian grandmother, who caught it during a trip to Hong Kong. The advisory will remain in effect for at least three weeks – twice the incubation period for the Sars virus.

The organisation's action sparked dismay among city officials and local business leaders, who feared it would spread fear and damage the economy. Dr Donald Low, the chief microbiologist at the city's Mount Sinai hospital, said the advice was "inappropriate".

"The damage has been done. Can you imagine booking a conference in Toronto for a year from now?" he said. The Bank of Canada last night trimmed its economic growth outlook for Canada from 3 per cent to 1.5 per cent, citing uncertainty over the impact of Sars.

WHO officials said they acted in part because the Sars virus had spread from Toronto to another country, which they did not name.

Global pariah, page 3

THE TIMES

No. 67545 THURSDAY APRIL 24 2003 45p NEWSPAPER OF THE YEAR www.timesonline.co.uk

Sars travel blacklist as toll rises

By Oliver Wright, Oliver August and Helen Rumbelow

THE World Health Organisation last night issued an unprecedented warning that the Sars epidemic had for the first time made a Western city unsafe to visit.

Amid rising international alarm, the WHO said the "magnitude of disease" meant it was advising travellers to avoid every thing the Canadian city of Toronto, where more than 300 people now have the potentially deadly illness and 15 have died.

The global health watchdog also advised against travelling to Beijing, where thousands of panicked residents flocked to the Chinese capital's two main railway stations to buy tickets for any destinations that were still available.

In a desperate attempt to contain infection the Chinese Government yesterday shut all schools for two weeks. Last night it announced it would quarantine hundreds of hospitals, schools or any other building suspected of infection, and gave warning that it would take "compulsory measures against anyone who refuses to co-operate".

British companies have began ordering expatriates returning from high-risk parts of the world, especially Asia to quarantine themselves at home for 10 days when they return. Tony Pilt, Marlboro Group, the Book of Sport, said all employees were quarantining staff and limiting non-essential travel to affected regions.

"We've decided that the safest place for them to be is at home. It is the logical thing to do when there is such a quarantine period," said a spokesman for Freshfields Bruckhaus Deringer, the City's largest law firm, which has suspended travel to several of its Far East offices.

The Government confirmed that it was updating its travel advice and from now, giving warning against non-essential travel to Hong Kong, Beijing, Toronto and the Chinese provinces of Guangdong and Shanxi. "There is now a real prospect of bans being extended," Sir Liam Donaldson, the Chief Medical Officer, said. "That is why the UK has taken the threat so seriously.

"There are now more than 4,000 reported cases of Sars from 25 countries on five continents and the disease is showing no sign of abating. Around the world 251 people have died of the disease, mainly in Asia, and a special outbreak of Asian bird flu has been called in Bangkok, Thailand, to discuss the crisis.

But in Toronto the authorities reacted with outrage to the WHO warning, which is likely to cost the city hundreds of millions of dollars in lost revenue. American newspapers have described Toronto as "the parade capital" and even before the WHO alert the American Association for Cancer Research had cancelled its annual conference, which would have brought some 20,000 people to the city.

Mel Lastman, the Mayor, said he was furious at the WHO decision, pointing out that only four million people lived in Toronto and that only 400 of them had been affected.

"If it's safe to live in Toronto, it's safe to come to Toronto," he said. He denied The medical evidence before us does not support the advisory and I am told they have never issued an advisory like this before in their history. I cannot believe they are not coming back for three weeks. I wish there here tomorrow."

But David Heymann, the WHO director of communicable diseases, said that the three-week window would be more in it was twice the syndrome's incubation period. He said the case for Hong Kong and Guangdong, we now have the three areas which have a high magnitude of disease, a great risk to communities locally and have contributed to exporting cases to other jurisdictions," he said.

In China, which has 300,000 British citizens visit each year, the Health Ministry reported 1,807 additional 147 cases and 11 deaths in the past 24 hours. The national description of Sars infections stands at 2,805 and the death toll at 96.

But for the first time, officials on the part of the Chinese authorities lies not to whitewash the gravity of the crisis.

Government has been criticised by some experts for its doing more.

Dr Patrick Dixon, who has conducted in studying the Aids epidemic, and is a director of the Centre for Management Development at London Business School, said that if current trends continued the Sars epidemic could rival Aids in Europe. "It is a very mysterious disease with a very dangerous factor, and it is immediately aggressive globally, so we have never seen anything like this before. It is spread so easily and ignorance there is a pandemic. It stands a chance of it continue as there is no cure, no vaccine, no treatment, no diagnostic test, no test yet, no test.

"If things continue as they are, with a mixture of complacency, delay and ignorance there is a pandemic. It stands a chance of it continue as there is no cure, no vaccine, no treatment, no diagnostic test, no test yet, no test.

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A policeman queues at a railway station in Beijing. Residents, panicked by the spread of Sars, are trying to leave the city and are stockpiling food and long lines of new quarantines

Gap year in China and stuck in school

Hannah Fletcher on Sars in Jiaxing

I ARRIVED in the classroom yesterday morning to find a black bin bag tacked with tape on an bare – or lying on my desk.

Before this week, news of the Sars outbreak had barely reached the school where I am teaching for a full year in the town of Jiaxing, in the south southwest of Shanghai. It was only through the e-mails I received from concerned friends and family in England.

That all changed early on Monday. Like the school's 1,000 students I was woken up by the usual intercom system being blasted over the harsh tones of hardboiled Mandarin. The official weekend was cancelled and instead of a long weekend, the half-term holiday starting on May 1 was also cancelled. I was informed by one of the Chinese Government, had finally come to the conclusion that the time for action had arrived.

Students were ordered to scrub their classrooms and wash their clothes. Signs on walls remind them to wash their hands, avoid crowded places and refrain from travelling. Groundsmen spray the campus, spraying it with disinfectant. The classrooms have been reduced to half the usual number of students.

The headmaster has announced that the campus is very safe, although she emphasised that "it is for myself and a fellow parent" student. Finally, to that whole school gates. The English teachers, referring to "the plague" – they're not not any more in the – Chinese snacks remain the exception rather than the rule.

The anxiety is rising. A fellow teacher said: "I am not worried for myself I have no dependents. If anything happens to me, no, then, all – But would be ignore the official advice and travel outside Jiaxing?" "Of course," he said. "I stay in school. I must stay safe."

THE SARS TIMEBOMB

16,000 people a week still fly into Britain from no-go cities

PANIC over the deadly Sars virus escalated last night.

Toronto became the first Western city declared a no-go zone in an unprecedented global health warning.

But white Britons have been advised not to go there, the Government here is doing nothing to screen travelers arriving from the Canadian city – or any other affected area.

Up to 13,500 passengers fly in to Heathrow every week on 45 flights from Canada's largest city, which is home to 2.5million people.

Canada has 224 probable or suspected cases of Sars, most of them in Toronto where 16 have died.

Yesterday the city joined the Chinese capital Beijing and the Shansi province on the World Health Organisation list of Sars-hit countries which are off-limits to travelers.

Another 3,000 people arrive at Heathrow every week on flights from Beijing, which has a population of 11million.

The WHO move follows similar health warnings over Hong Kong and the Guangdong region of China, which are stricken with cases of the pneumonia virus.

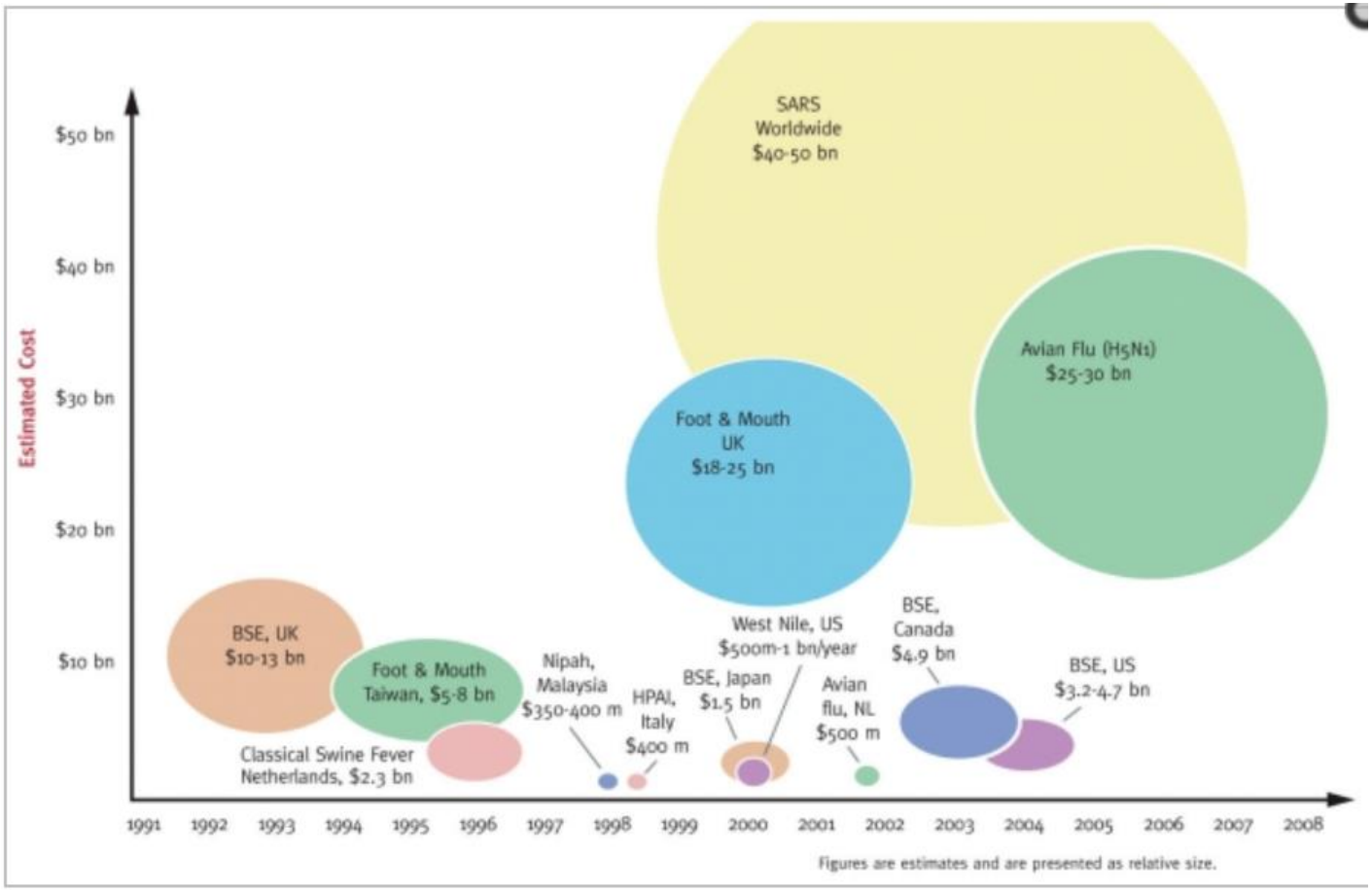
There are fears that Britain is vulnerable to outbreaks of the disease from those flying in from high-risk areas following haphazard checks at airports there.

Complacency could hasten the spread of the virus, which has infected 4,200 worldwide through air travel and claimed 254 lives, it

By Beezy Marsh, Health Correspondent

Turn to Page 6, Col. 1

Economic impact of selected outbreaks



Source:Daszak NCBI 2009

Future Challenges: Antimicrobial Resistance

- $10,000,000,000,000 projected loss to global GDP from AMR by 2050
- 10,000,000 deaths per year by 2050

- *Source: O'Neill review 2014*

Control programmes

- Screening
- Early detection and surveillance (people and animals)
- Behavioural interventions in health care and community (reduce transmission)
- Treatment (reduce infectivity, shorten infectious period)
- Appropriate antimicrobial prescribing
- ‘Quarantine’, social distancing etc (reduce transmission)
- Contact tracing (early identification of secondary cases) etc
- Vaccines (immunity to infection)

Requirements for effective control

Workforce competencies

- Field epidemiology, functioning national surveillance and emergency response capacity
- Microbiology and lab network
- Bio and Health informatics
- Mathematical modelling

Technologies

- Diagnostics
- Molecular epidemiology
- Vaccines
- Antimicrobials

Requirements for effective control

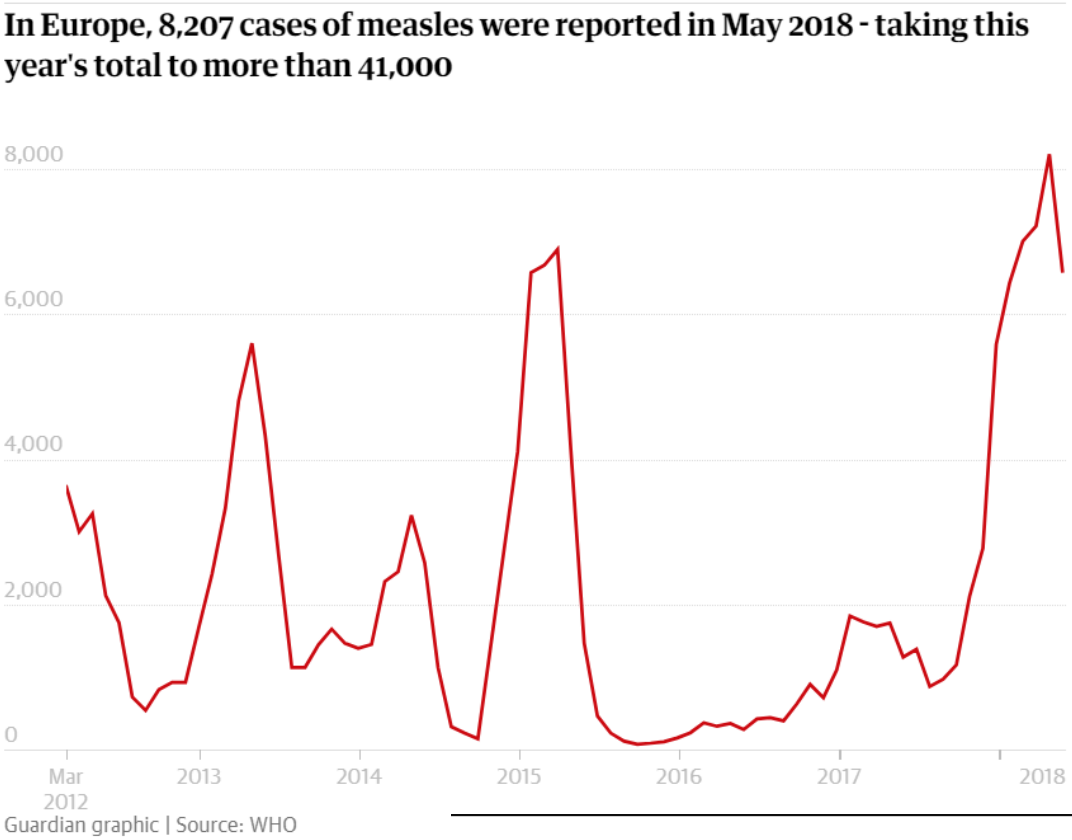
Health Systems

- Functioning national public health capacity for detection and response (endemic and outbreaks)
- Health Care system for treatment and infection control
- Communication with public (eg AMR, Vaccine confidence)
- National vaccination programme (eg measles)
- International coordination and response (eg Flu.SARS)

Research and development

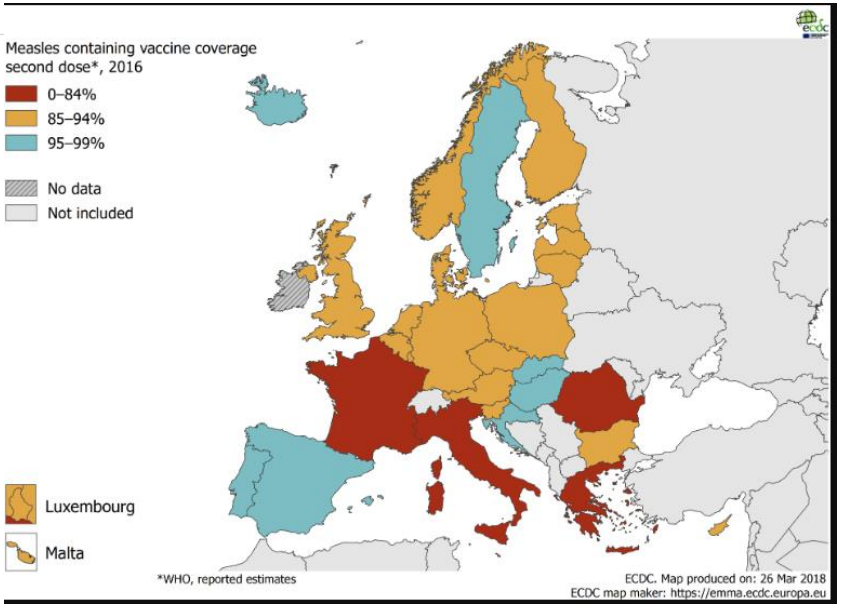
- Vaccines, diagnostics, AMR , emerging infections, digital surveillance etc, population cohorts

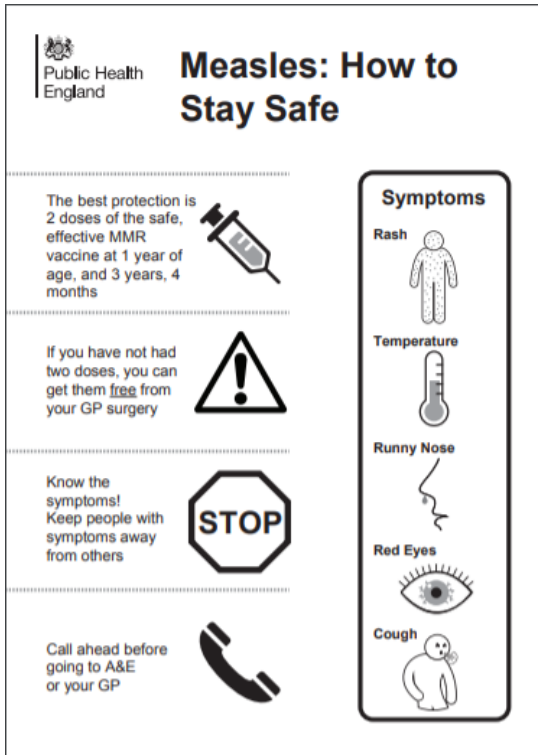
Vaccine preventable infection



Measles outbreaks in Europe

- Surveillance,
- Outbreak response
- Communication,
- Vaccination





Novel and Emerging approaches to understanding transmission dynamics of infections (and their challenges)

- Classic surveillance (clinics and labs)
- Cohorts combining biological and behavioural measures
- Molecular epidemiology
- Health informatics
- Social media/internet searches
- Remote diagnostics

FLU WATCH

SWINE FLU: THE PERFECT STORM

By Jenny Hope and Sophie Borland

Flu victims soaring, vomiting bug spreading, more elderly falling ill ... so how will our hospitals cope?

A 'PERFECT storm' of winter illness will batter Britain's health services today.

Hospitals will be pushed to breaking point by a post-Christmas deluge of patients suffering from flu and the winter vomiting bug.

Accident and emergency departments

because two-thirds of the population di
not get swine flu during the last two out
breaks, they risk falling victim now.

Dr Jim Wardrope, former president o
the College of Emergency Medicine, wh
works at the Northern General Hospita
in Sheffield, warned today would be on
of the busiest of the year for hospitals.

'There is usually a peak after bank holi
day weekends and this one has lastec
four days,' he said. 'There is definitely
extra pressure at the moment.

'We have a perfect storm of flu and
norovirus and the last few days have

THE LANCET Respiratory Medicine

Comparative community burden and severity of seasonal and pandemic influenza: results of the Flu Watch cohort study

Andrew C Hayward, Ellen B Fragaszy, Alison Bermingham, Lili Wang, Andrew Copas, W John Edmunds, Neil Ferguson, Nilu Goonetilleke, Gabrielle Harvey, Jana Kovar, Megan S C Lim, Andrew McMichael, Elizabeth R C Millett, Jonathan S Nguyen-Van-Tam, Irwin Nazareth, Richard Pebody, Faiza Tabassum, John M Watson, Fatima B Wurie, Anne M Johnson*, Maria Zambon* on behalf of the Flu Watch Group

The Lancet Respiratory Medicine
Volume 2, Issue 6, Pages 445-454 (June 2014)
DOI: 10.1016/S2213-2600(14)70034-7

Main findings

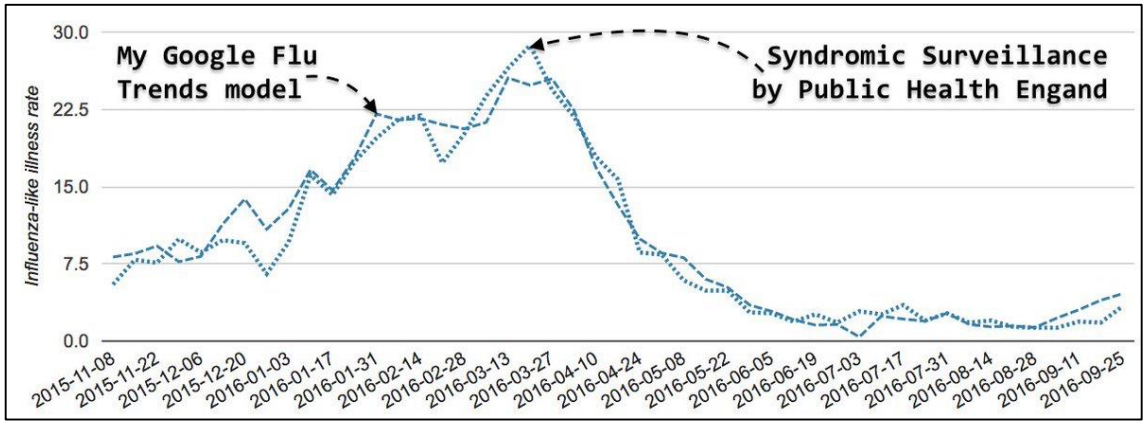
- *Based on 4 fold titre rises on average influenza infected 18% of unvaccinated people each winter.*

- *Most infections (>70%) were asymptomatic (and never reached clinical care).*

- *These figures did not differ significantly when comparing pandemic with seasonal influenza.*

- *Pandemic PCR-confirmed cases had markedly* ***less severe*** *symptoms than those infected with seasonal H3N2*

Using social media and search queries to track flu-like illness



Wagner, M., Lampos, V., Cox., I. J., and Pebody, R. 'The added value of online user-generated content in traditional methods for influenza surveillance.' Scientific Reports (2018)

- Algorithm trained on **Google search data** showed Pearson **correlation of 0.96** compared to data from the Royal College of General Practitioners
- **Outbreak detection 4 days earlier** than traditional surveillance
- i-sense Flu algorithms now **adopted by Public Health England for national flu surveillance** and used in most recent annual flu report

Contrasting stories: Public Health weaknesses, scientific progress

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25 January 2015 Last updated at 15:01

Share

Ebola crisis: 'Too slow' WHO promises reforms

Ebola testing at the African Cup of Nations football tournament in Bata, Equatorial Guinea

The World Health Organization (WHO) has set out plans for reform, admitting that it was too slow to respond to the deadly Ebola outbreak in West Africa.

At an emergency session in Geneva, director-general Margaret Chan said Ebola had taught the world and the WHO how they must act in the future.

She said the corner had been turned on infections but warned over

Ebola outbr

Why Ebola is dangerous

Year of Ebola

Mapping the

The Ebola outbreak, 2013–2016: old lessons for new epidemics

Cordelia E. M. Coltart[1,†], Benjamin Lindsey[2,†], Isaac Ghinai[1,†], Anne M. Johnson[1] and David L. Heymann[2,3]

[1]Research Department of Infection and Population Health, UCL, London WC1E 6JB, UK
[2]Chatham House, London SW1Y 4LE, UK
[3]London School of Hygiene and Tropical Medicine, London WC1E 7HT, UK

Efficacy and effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein: interim results from the Guinea ring vaccination cluster-randomised trial

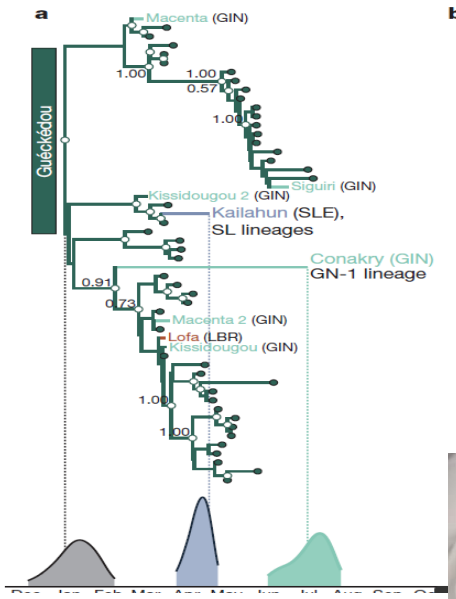
CrossMark

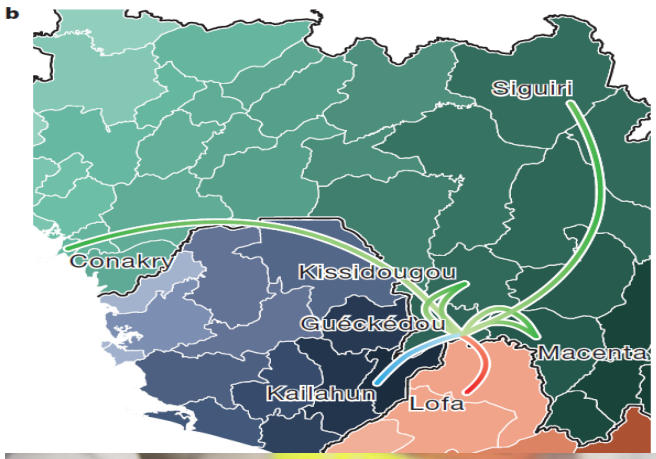
Ana Maria Henao-Restrepo, Ira M Longini, Matthias Egger, Natalie E Dean, W John Edmunds, Anton Camacho, Miles W Carroll, Moussa Doumbia, Bertrand Draguez, Sophie Duraffour, Godwin Enwere, Rebecca Grais, Stephan Gunther, Stefanie Hossmann, Mandy Kader Kondé, Souleymane Kone, Eeva Kuisma, Myron M Levine, Sema Mandal, Gunnstein Norheim, Ximena Riveros, Aboubacar Soumah, Sven Trelle, Andrea S Vicari, Conall H Watson, Sakoba Kéïta, Marie Paule Kieny, John-Arne Røttingen**

Epidemic response needs functioning public health systems as well as phylogenetics!

doi:10.1038/nature22040

Virus genomes reveal factors that spread and sustained the Ebola epidemic





Data used for:

1. Outbreak emergence and evolution

2. Geographical spread

3. Mode of transmission (human-to-human) and routes of transmission e.g. sexual

5. Where and how fast mutations were occurring

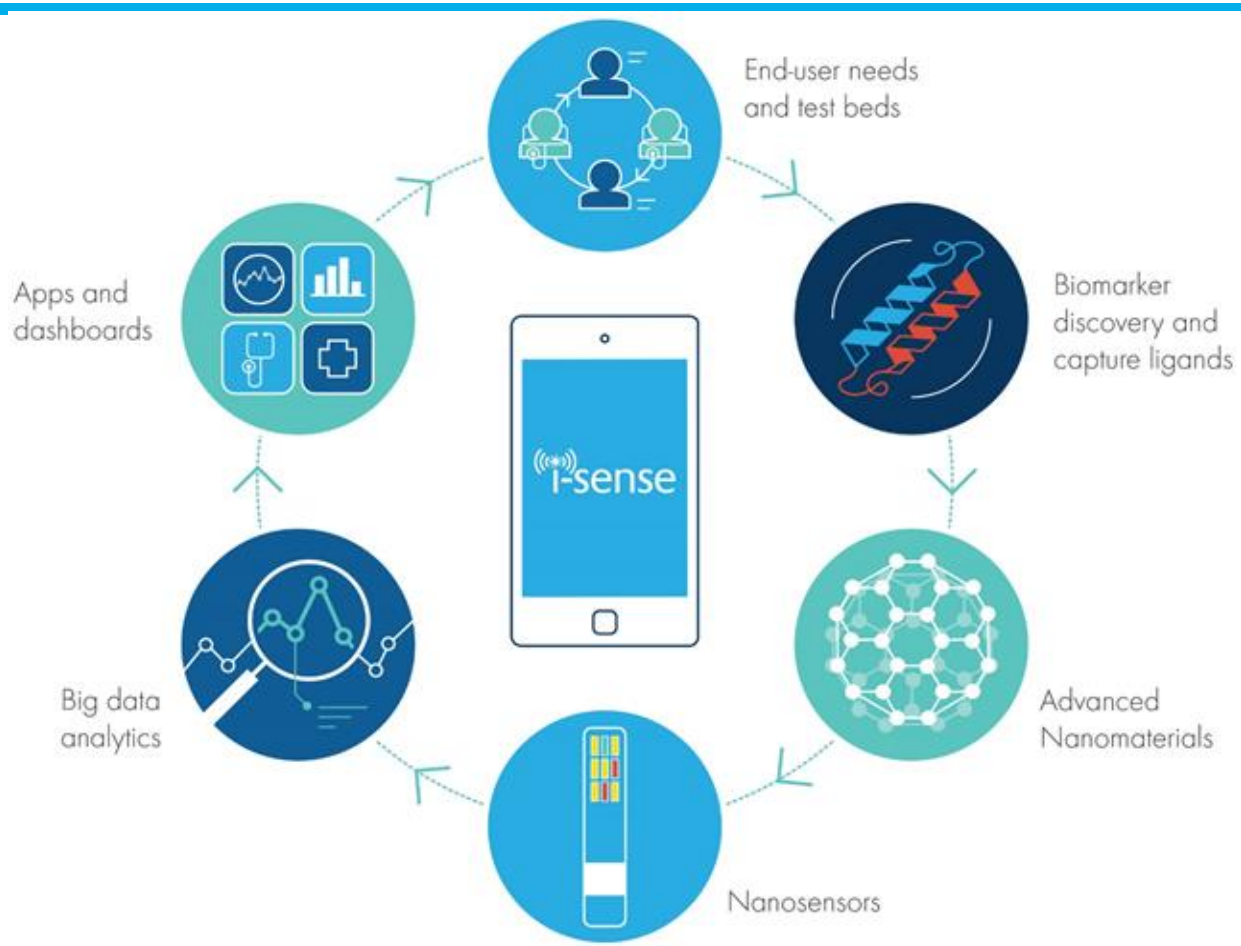
- Essential for diagnostics, vaccines and antibody-based therapies

•Has the potential to inform intervention strategies….

•But classical outbreak investigation and coordinated response essential combined with research

• Data sharing remains inadequate

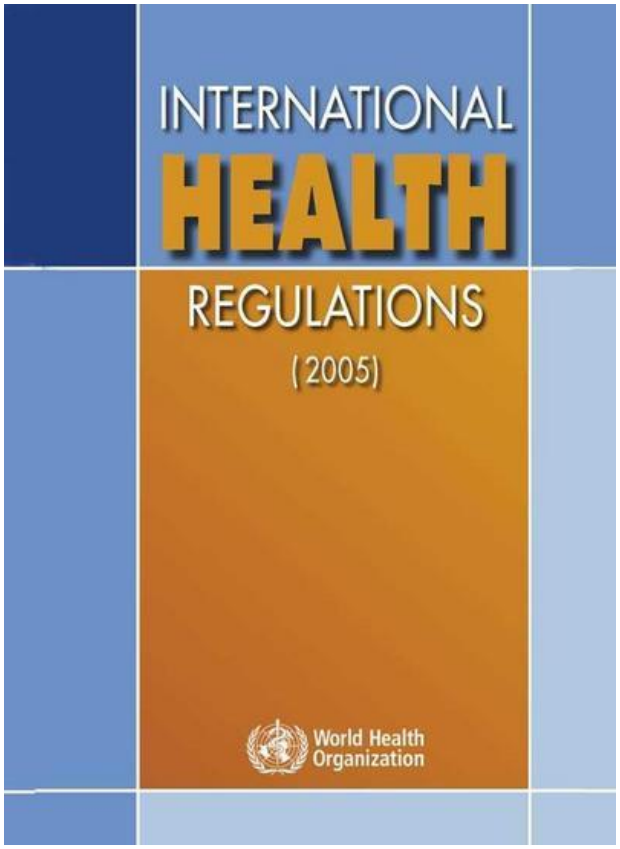
Digital futures: Interdisciplinary Approach to Rapid Point of Care Diagnostics Development and digital care and surveillance pathways



Novel and Emerging approaches to understanding transmission dynamics of infections (and their challenges)

- Classic surveillance (clinics and labs) (incomplete many biases)
- Cohorts combining biological and behavioural measures (costly, needs to be timely)
- Molecular epidemiology (from philately to intervention)
- Health informatics (systems, capacity, governance, data linkage, public trust)
- Social media/internet searches (ethics and governance, data access)
- Remote diagnostics (care pathways, data capture, user confidence)

International cooperation essential to control



CEPI

New vaccines
for a safer world