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share and move to face nasty bugs

## Evaluating public health interventions against pandemics

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**Data Mining International**  
**SESSION 2A**

**The ASSET FINAL EVENT**

*Share and move for mobilization and mutual learning at local, national and international levels on Science in Society related issues in epidemics and pandemics*

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# Which outcome for assessing various public health interventions?





# Hygiene promotion strategies

## CATCH IT

Germs spread easily. Always carry tissues and use them to catch your cough or sneeze.



## BIN IT

Germs can live for several hours on tissues. Dispose of your tissue as soon as possible.



## KILL IT

Hands can transfer germs to every surface you touch. Clean your hands as soon as you can.



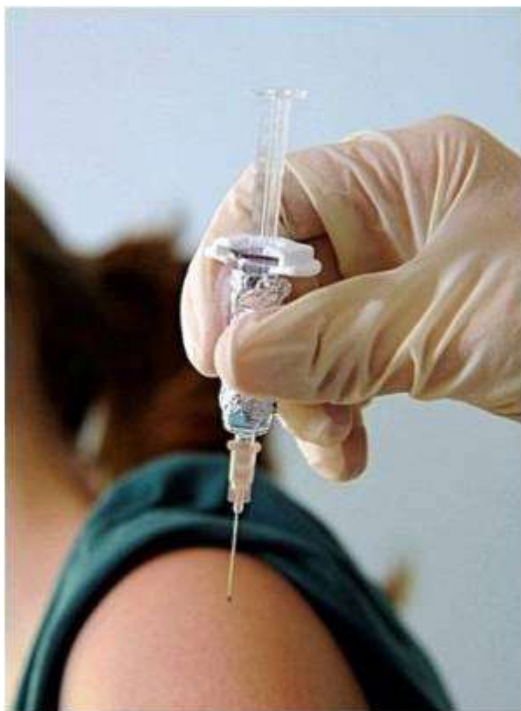


# Screening strategies





# Vaccination strategies



- **General population ?**
- **Health professionals ?**
- **At risk populations ?**





# Antiviral strategies



- Curative ?
- Preventive ?





# Containment strategies





# Quarantine strategies



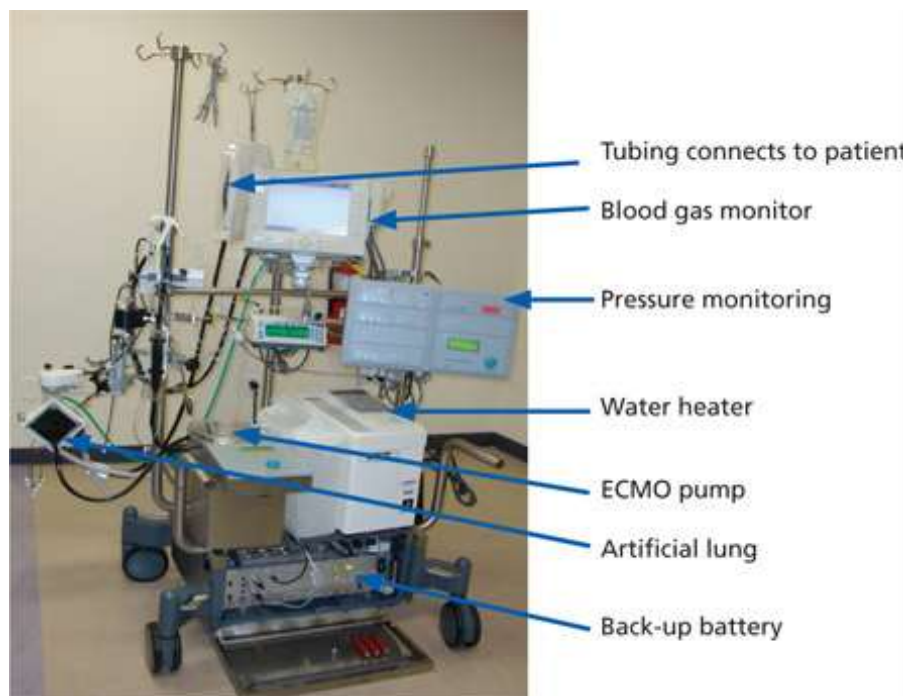
**QUARANTINE**





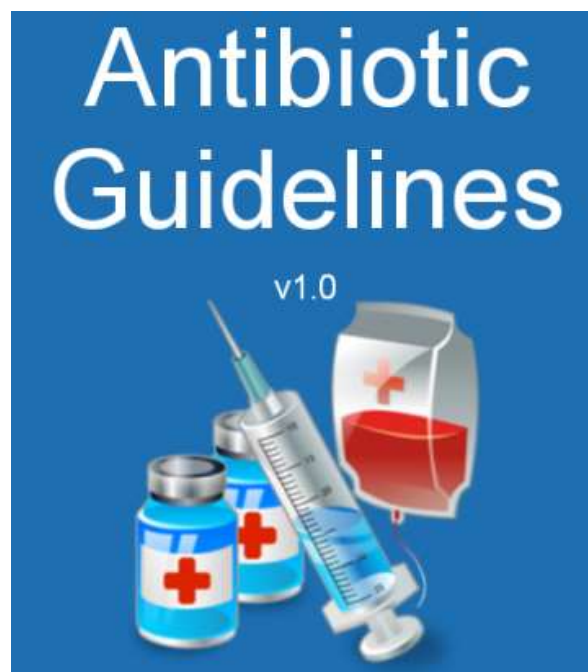


# Development of ECMO





# Dissemination of Antibiotic Guidelines





# Which “standart” outcome for assessing various public health interventions?

- **Morbidity ?**
- **Mortality ?**
- **DALY/QALY ?**
- **Costs ?**
- **Cost-Effectiveness ?**





# Morbidity outcomes

- **Impact of measures on Prevalence / Incidence**
- **Need of performance Threshold**
  - **ie: achieving 20% of morbidity reduction**





# Mortality outcomes

- **Impact of measures on mortality**
- **Need of performance Threshold**
  - **ie: achieving 30% of morbidity reduction**





# Disability Adjusted Life Years (DALY)

# Quality Adjusted Life Years (QALY)

**DALY :synthetic indicator derived from the product of 2 parameters**

$$\text{DALY} = \text{Disability} * \text{Survival (time)}$$

**QALY : synthetic indicator derived from the product of 2 parameters**

$$\text{QALY} = \text{“Quality of Life”} * \text{Survival (time)}$$

**Disability and Quality of Life are expressed in UTILITY measure**





## What Does « Utility » Mean ?

**Utility = Preference score**

**If health state A is preferred to health state B,**

**then**

**utility (A) > utility (B)**





## DALY/ QALY concept

- 0= death
- 1= perfect health
- 2 years at 0.5 health state = 1 year in perfect health
- 10 years at 0.2 health state = 2 years in perfect health
- Etc.

**Now, is cooking pasta for 20 minutes at 50° C hot water  
*the same* as cooking pasta for 10 minutes at 100°C hot water**







# “Collective” aggregation issue of the QALY/DALY Indicator

	1	2	3	4	QALY/DALY	
Strategy A		0.3	0.4	0.3	0.2	1.2
Strategy B		0	0	0.6	1	1.6

**Strategy B is better than strategy A**





## Applying the DALY/QALY method to decide between 2 locations for a future conference

**1 day in ROME  
versus  
2 days in OSLO ?**

Utility expressed in outside air temperature (°C)





## Divergent DALY/QALY Using the Same Data !

**DALY/QALY = Time x Temp (°C)**

- OSLO                      2 days x 5 °C = 10 QALY
- ROME                      1 day x 25 °C = 25 QALY

**⇒ Go to Rome !**

**DALY/QALY = Time x Temp (°F)**

- OSLO                      2 days x 41 °F = 82 QALY
- ROME                      1 day x 77 °F = 77 QALY

**⇒ Go to Oslo**



# Methodological recommendations of the ECHOUTCOME European project

ECHoutcome



# **Recommendation ECHOUTCOME European project DALY and QALY Assessment for Healthcare Decision Making Should Be Abandoned**

- **Underlying assumptions are not validated**
- **Possibility of divergent results**
- **Subject to technical manipulation**
- **Equity and ethical issues**
- **Emerging evidence suggests that different methods should be used**







# Multi-assessment of public health interventions against influenza pandemics: Main results of the FLURESP European project





# FLURESP European project main features

- **18 public interventions against influenza pandemics**
- **6 pandemic scenarios**
- **2 effectiveness criteria**
  - **Costs to achieve 40% reduction of mortality**
  - **Costs to achieve 30% reduction of morbidity**
- **4 target countries**
  - **France**
  - **Italy**
  - **Poland**
  - **Romania**







## 18 interventions

- Individual measures
- Border control measures
- Community control measures
- Protection measures in existing health care facilities
- Protection measures in specific health care facilities
- Vaccination at-risk population existing organizations
- Vaccination at-risk population specific organizations
- Vaccination health professionals existing organizations
- Vaccination health professionals specific organizations
- Vaccination general population existing organizations
- Vaccination general population specific organizations
- Antiviral prophylactic distribution
- Antiviral curative distribution
- Antibiotherapy guidelines
- Pneumococcal vaccination
- Development of new ICU capacity
- Development of ECMO
- Screening measures





## 6 pandemic levels

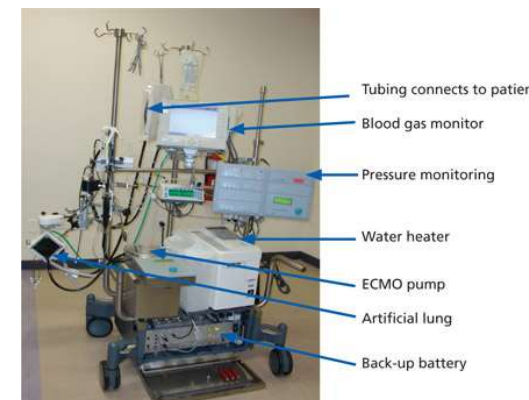
- **Scenario A:** “seasonal flu”
- **Scenario B:** “2009 pandemic like”
- **Scenario C:** “community risk / low virulence”
- **Scenario D:** “community risk / high virulence”
- **Scenario E:** “high risk groups / age classes”
- **Scenario F:** “major event”





## Mortality criteria: most cost-effective : ECMO

- Scenario A: 890'084      €/Success**
- Scenario B: 963'831      €/Success**
- Scenario C: 1'183'044    €/Success**
- Scenario D: 187'849'752   €/Success**
- Scenario E: 187'849'752   €/Success**
- Scenario F: 1'310'044'222 €/Success**





## Mortality criteria: less cost-effective : Screening measures

**Scenario A: 498'544'339'333 €/Success**

**Scenario B: 498'544'339'333 €/Success**

**Scenario C: 498'544'339'333 €/Success**

**Scenario D: 498'544'339'333 €/Success**

**Scenario E: 498'544'339'333 €/Success**

**Scenario F: 498'544'339'333 €/Success**





# Mortality criteria

## Curative antiviral distribution more cost-effective than prophylactic distribution

### Curative antiviral distribution

Scenario A: 235'430'386 €/S  
Scenario B: 235'430'386 €/S  
Scenario C: 477'321'064 €/S  
Scenario D: 477'321'064 €/S  
Scenario E: 555'421'214 €/S  
Scenario F: 555'421'214 €/S

### Prophylactic antiviral distribution

Scenario A: 2'560'624'765 €/S  
Scenario B: 5'109'803'409 €/S  
Scenario C: 12'101'836'920 €/S  
Scenario D: 12'101'836'920 €/S  
Scenario E: 12'101'836'920 €/S  
Scenario F: 13'791'275'979 €/S





## Morbidity criteria

**Vaccination of general population  
more cost-effective than vaccination of at-risk groups**

**Vaccination  
general population**

Scenario A, B, C, D, E, F:

**1'195'413'559 €/S**

**Vaccination  
At-risk group**

Scenario A, B, C, D, E, F:

**6'247'235'405 €/S**





# Evaluating Public Health interventions against pandemics : Conclusion

- Interest to assess public health interventions Pharma and non Pharma
- Importance to use methodologically robust and meaningful outcomes
- Interest to take into account costs of interventions

