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share and move to face nasty bugs

Evaluating public health interventions against pandemics

Ariel Beresniak, MD, MPH, PhD
Data Mining International
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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.



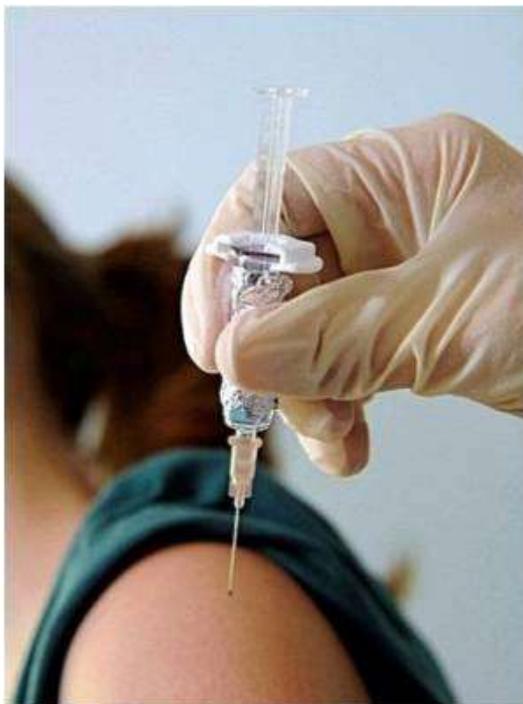


Screening strategies





Vaccination strategies



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





Antiviral strategies



- Curative ?
- Preventive ?





Containment strategies





Quarantine strategies



QUARANTINE





Development of ECMO



Tubing connects to patient

Blood gas monitor

Pressure monitoring

Water heater

ECMO pump

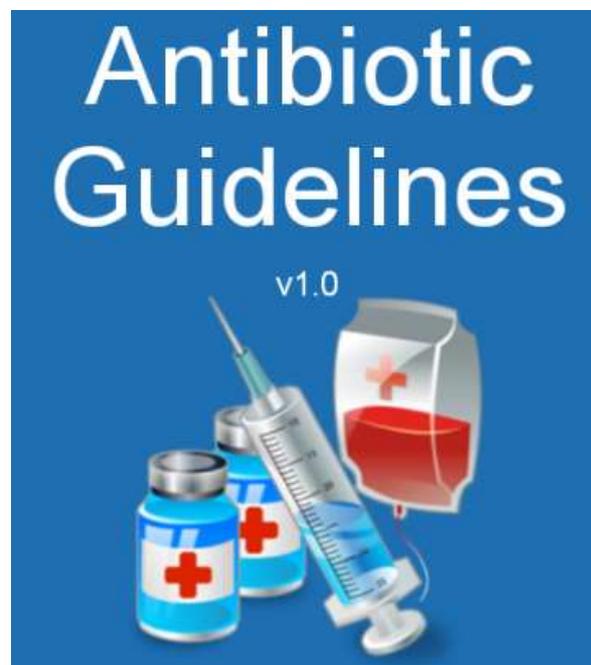
Artificial lung

Back-up battery





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 ($^{\circ}\text{C}$)





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**

ECHoutcome







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

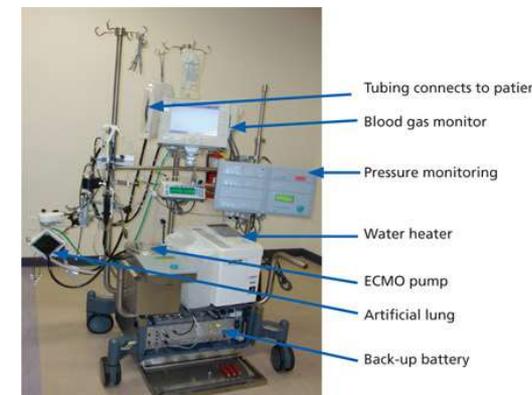
- **Scenario A:** “seasonal flu”
- **Scenario B:** “2009 pandemic like”
- **Scenario C:** “community risk / low virulence”
- **Scenario D:** “community risk / high virulence”
- **Scenario E:** “high risk groups / age classes”
- **Scenario F:** “major event”





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

