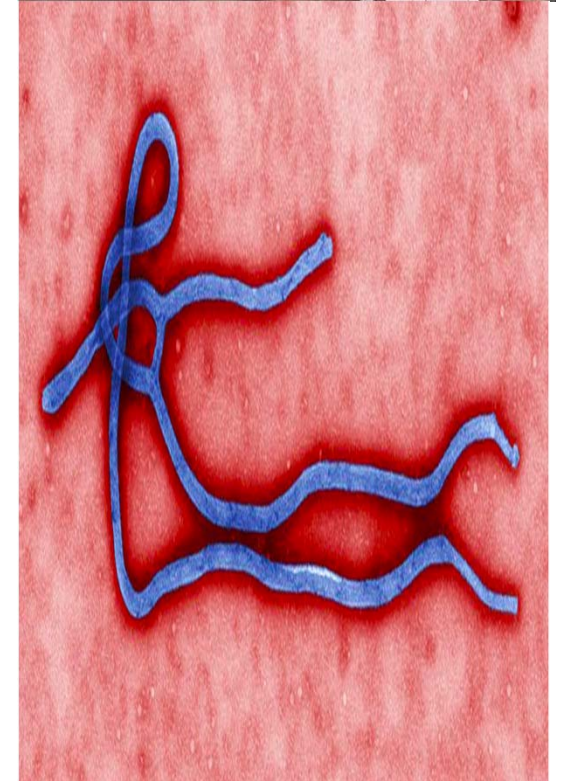
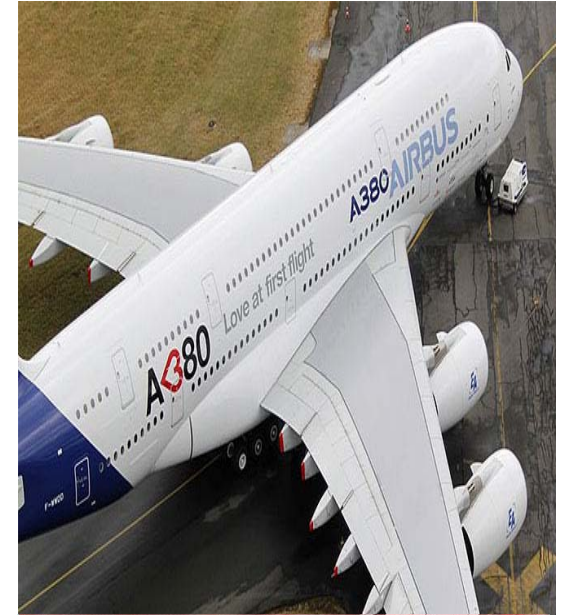


# ANALYSIS OF SCREENING AT INTERNATIONAL AIRPORTS-H1N1,SARS & EBOLA



# Background

- ▶ Annually,est 700 airlines transport over 3 billion travelers between 4000 airports.
- ▶ Contributing Factors:Urbanation, Increases in international travel and trade, Climate change,ect
- ▶ While growth in air travel confers tremendous benefits to humankind
- ▶ It also expands the opportunities for local infectious disease outbreaks to transported
- ▶ Swiftly into international epidemics that can threaten global health, security and prosperity



# WHO Entry Exit & Exit Screening Requirements

- ▶ Following the SARS ,H1N1 & Ebola Outbreak
- ▶ Individual States began to screen travelers on entry in airports, ports and border crossings
- ▶ To try to delay or prevent local transmission
- ▶ H1N1 /Ebola experience demonstrated the power of the IHR (2005),Ebola
- ▶ It also highlighted the shortcomings, particularly reliance on uneven national capacities
- ▶ Some countries from making unilateral decisions



# WHO Entry Exit & Exit Screening Requirements

- ▶ It is essential to implement public health measures (entry and exit screening )at airports within the context of the IHR Context.

States must base their determination on the application of Public Health Measures(Screening on) :

- Scientific Principles
- Shall not be restrictive of international travel
- Not invasive or intrusive (Thermal Scanners)





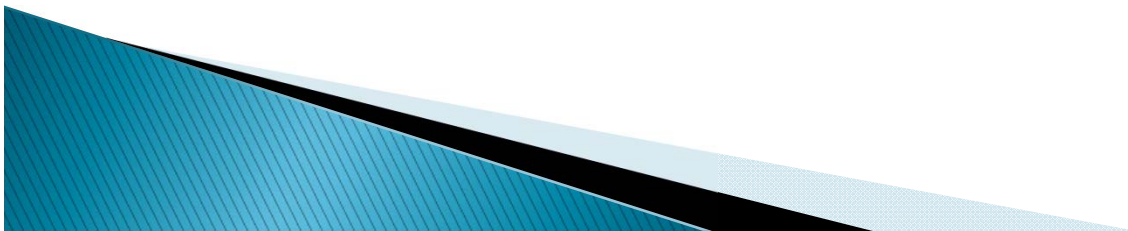
# WHO Entry Exit & Entry Requirements

- ▶ Who Currently has no standardized procedures for health screening at airports
- ▶ Leading to States to make individual regional decisions
- ▶ While all WHO Member States are legally obligated to follow the IHR (2005).
- ▶ There are concerns about **no formal penalty** for failure to implement exit or entrance screening by WHO of a potential PHEIC.
- ▶ Some countries have requested an extension in the implementation of IHRs



# How does State Respond to PHEIC

**With a public health emergency of  
international concern (PHEIC)**



# Symptoms/Signs & Incubation Period



## Initial symptoms:

- High Fever
- Headache
- Fatigue
- Abdominal Pain
- Myalgias
- Prostration
- Pharyngitis
- Conjunctival Infection
- Facial & Chest Flushing
- Diarrhoea & Vomiting



## More advanced disease:

- Hematemesis & bloody diarrhoea
- Nondependent Oedema
- Generalized mucous membrane haemorrhage
- Petechial or Ecchymotic Rash
- Frank Bleeding
- Altered mental status
- Cardiovascular collapse

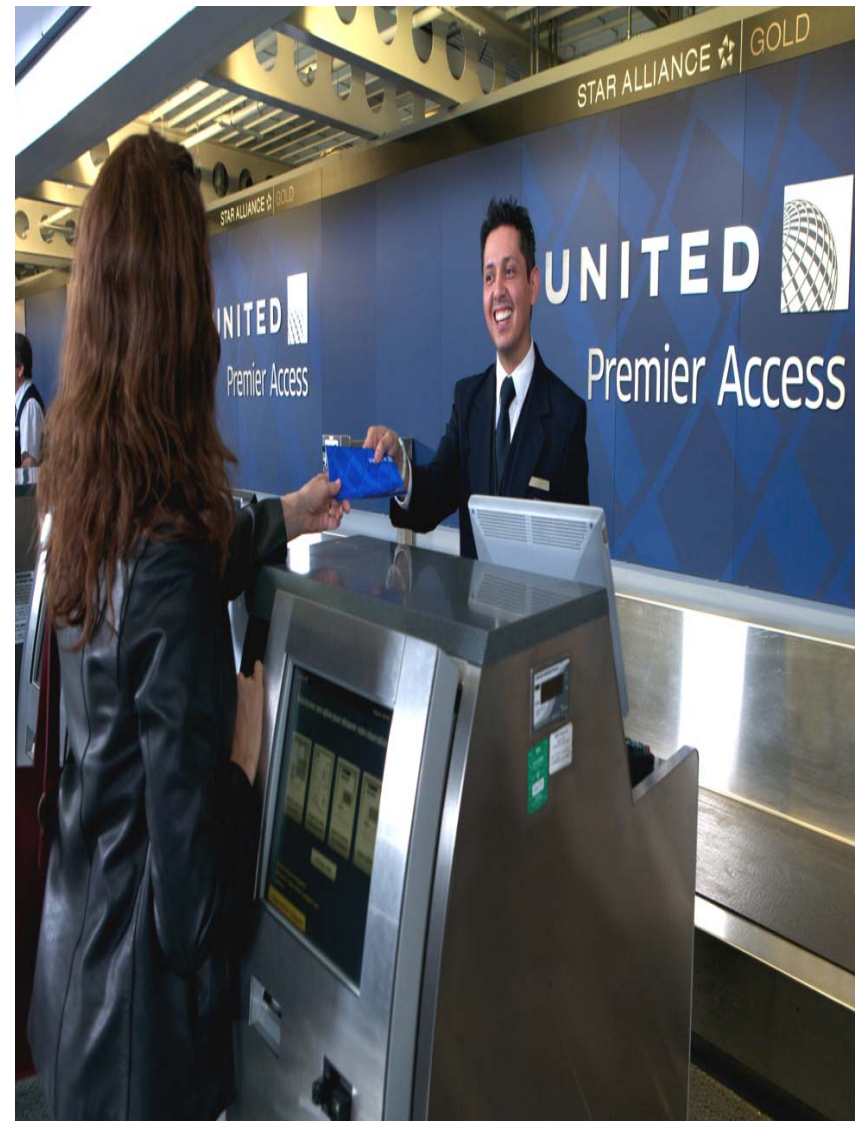
Assumptions all patients present with symptoms & signs





# Visual Inspection–Check–In Counters

- ▶ Easy & Affordable
- ▶ Complaints from DOH of passengers being allowed to board.
- ▶ While visibly ill
- ▶ Some Airlines conduct their check-in outsource & others outsource
- ▶ Who then should provide symptoms & signs to check-in counters–Enforce
- ▶ Where–affected area or all countries–? Enforce Practical.
- ▶ When–Outbreaks only–Daily briefings with crew
- ▶ Training of staff & regular updates.



# Visual Inspection–On Board Aircraft–Limitations– Nigerian Case



# Targeted Airline Methods of Screening

- ▶ If incubation is long(2–21 days)
- ▶ 24 hours circumnavigations of the Globe
- ▶ Do you know were the passengers has been in 21 days?
- ▶ Passengers with Dual Passports
- ▶ Targeted Airlines, what about Charters Operators (Mining) from an Affected Area
- ▶ Connections from Affected Areas by Airlines not originating in the affected area SA – Emirates.
- ▶ How are decisions for screening on High vs Medium Risk Affected Areas(Guinea Vs DRC)





# Targeted Various Airlines of Screening

- ▶ Conduct this screening–Visual (? Meet aircraft),Printing & Analyzing Questionnaires
- ▶ Does Port Health Authorities have contingency plans–increase staff
- ▶ Pre–Approval Questionnaires applications from affected areas prior to departure
- ▶ Procedure for passengers coming from an affected area clear and accessible–Home Affairs will turn passengers/Charter coming in and out without being identified.
- ▶ What is the time taken to process the approval docs and is the information accurate.





# Ports Health–Visual Inspection/Doc Inspections



# Screening Thermal-Medical Examinations





# Thermal Screening



# Indiscriminate Screening

- ▶ What Method of Screening?
- ▶ How busy is your Airports
- ▶ Is it practical





# Pre-Approval Screening for Air Ambulance Processes

- ▶ Does a State have a Pre-Approval Screening Procedure for Air Ambulances.
- ▶ What International Standards (e.Eurami,others) are used for transporting Suspected Cases
- ▶ Is the local CAA involved, if not compliant who do you complain to?
- ▶ Are local & international Ambulance Operators compliant to the pre-approval procedure before bringing a patient to a State?



# Pre-Approval Screening for Air Ambulance Processes

- ▶ Who's is enforcing if there are concerns
- ▶ Is the Department issuing Foreign Operator License aware of the DOH Pre-Approval Process(SA Experience)
- ▶ Can ATC ( Flight Plan) & Foreign Operators License-Play a role in assisting in the Pre-Approval Process



# Screening Documentation as a Tool

- Health advice and alerts to travellers–How early does the country issue these(SA April–2014)
- Health declaration form
- Questionnaires
- Locator Forms
- ? Passports





# Other Visual Screening Opportunities Airports/Security





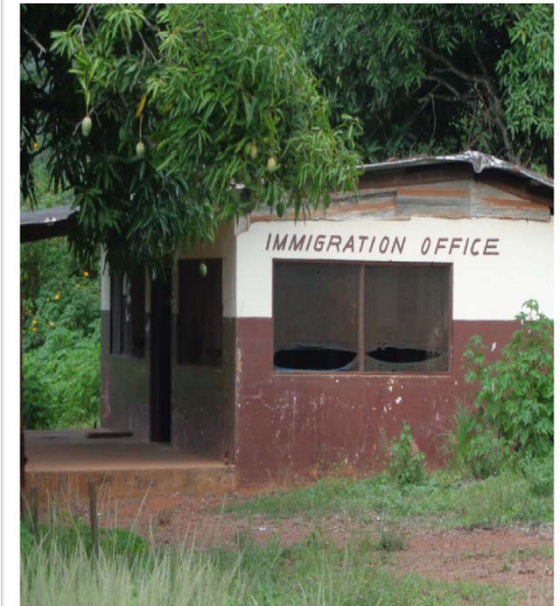
# Exit Screening -Issues to Consider





# Exit Screening –Reality

- Demands on resources of the affected States Increased–Follow-up Contacts,PPE,Health Workers
- State of Public Health Facilities prior to the outbreak
- Affected State priority–Not Exit Screening
- Borders may be porous–lack of control & resources
- Little International emphasis on assisting affected States with Public Health Measures
- Minimize transmission containing & containment at the source
- Early Intervention–Exit Screening



# Targeted Airports

How do States decide on a High Risk International Airports?

- Who decide—Health vs Combination Aviation—Health

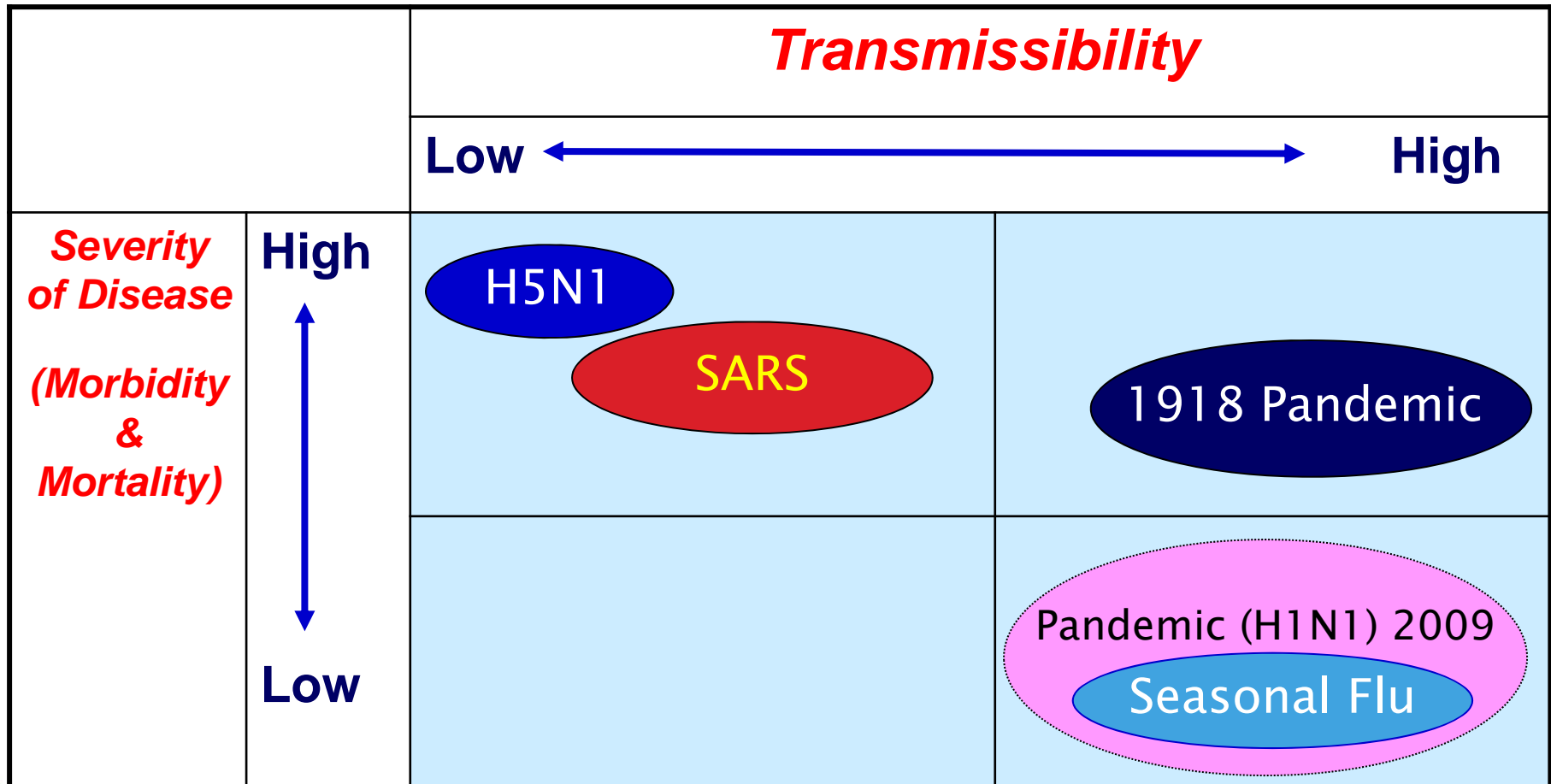
Basis for decision:

- No Passengers/Flights at Airports coming from an Affected Area
- Are connecting flights and charter considered
- Are passengers from affected areas directed to Airports with Port Health Authorities.



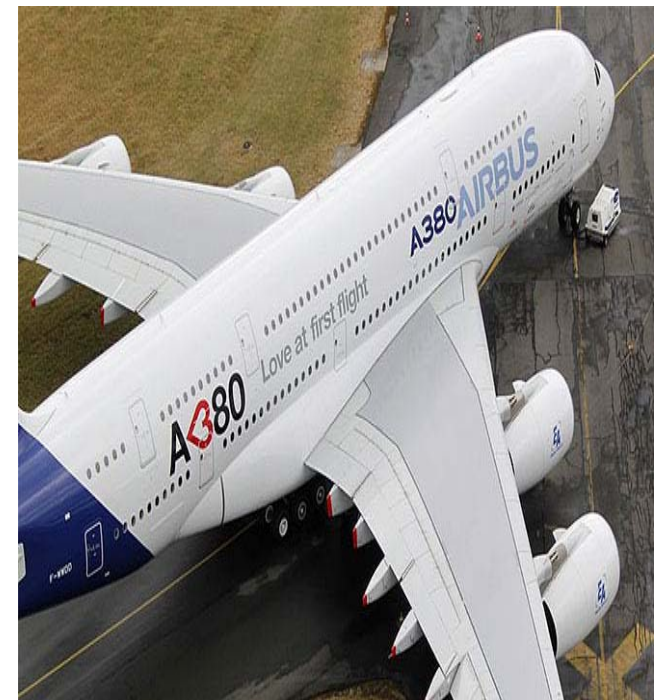
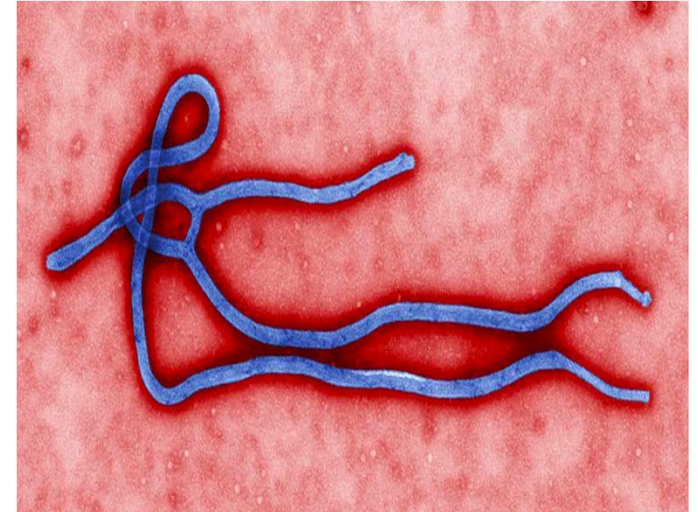


# What should States Consider—Comparative risk of outbreaks

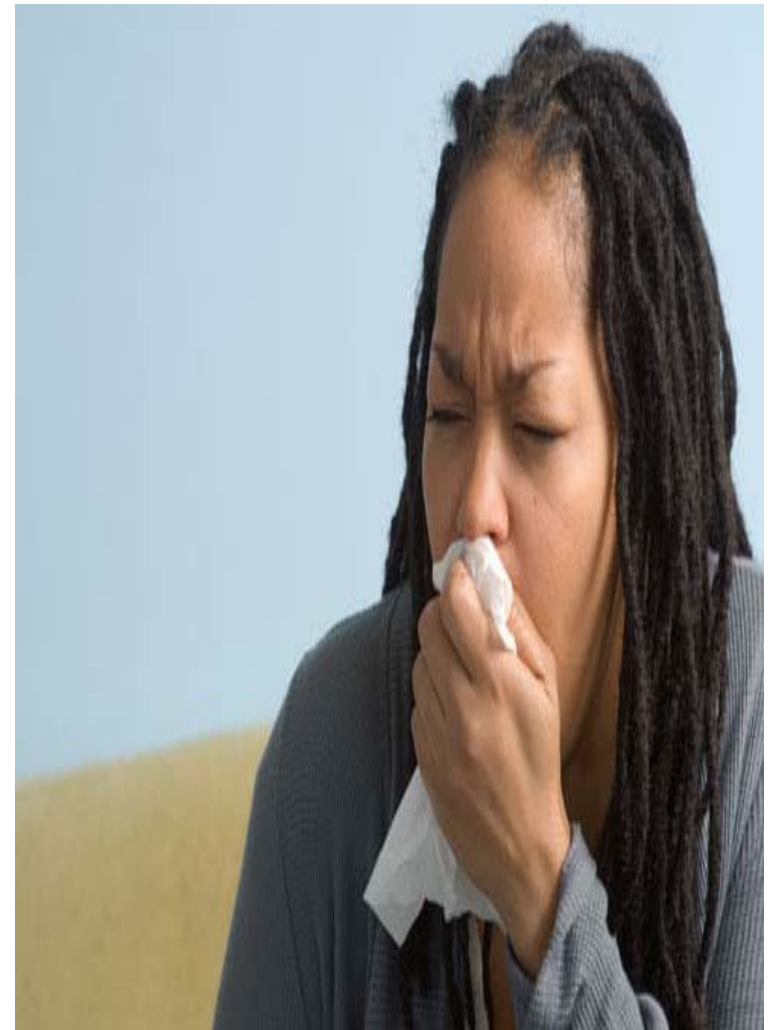
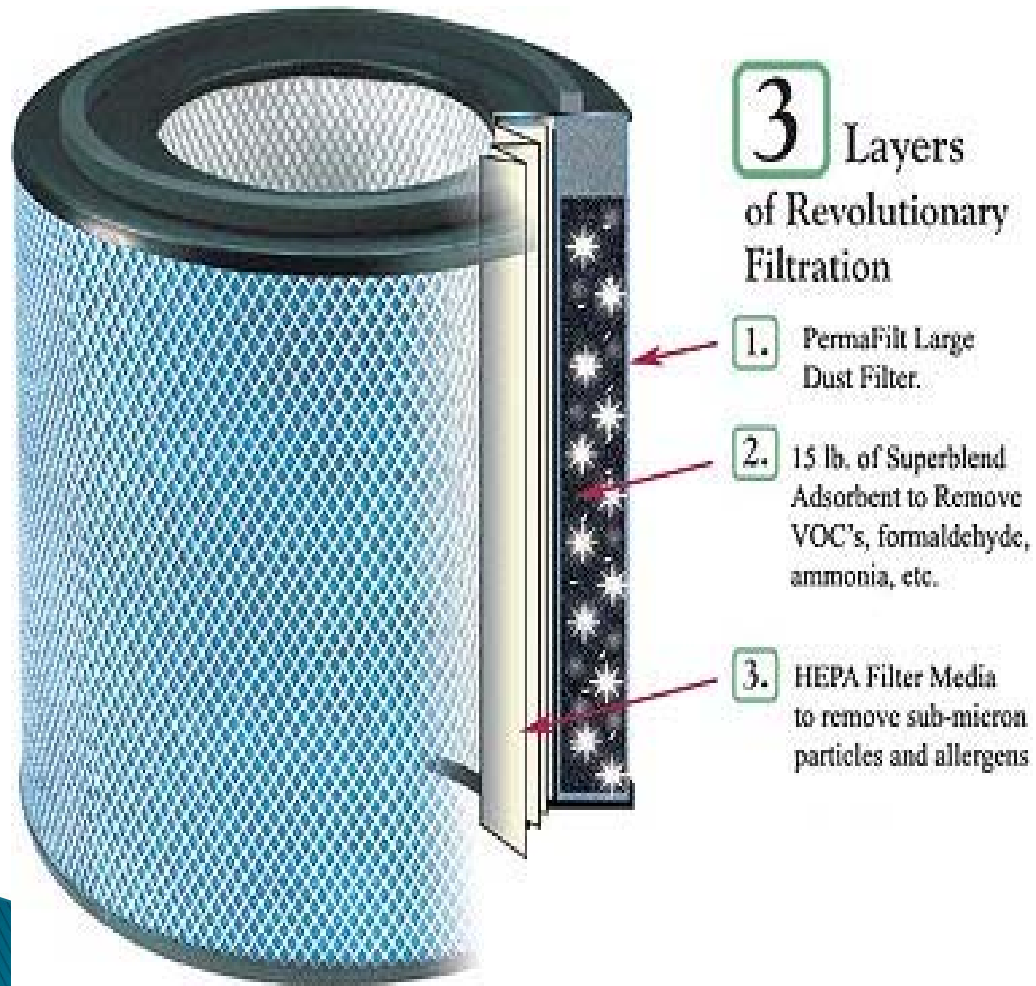


# Factors that affect probability of disease transmission on board aircraft

- ▶ Mode of transmission of infection(SARS or Ebola).
- ▶ Duration of exposure(Short vs Long Haul Flights)
- ▶ Infectivity of index case (ill person) during flight in the symptomatic/pre-symptomatic (incubating) period (Ebola vs SARS)
- ▶ Airplane technical specs(Quality of cabin air)
- ▶ Effectiveness of exposure
  - *Proximity to index case, laminal, longitudinal & horizontal*



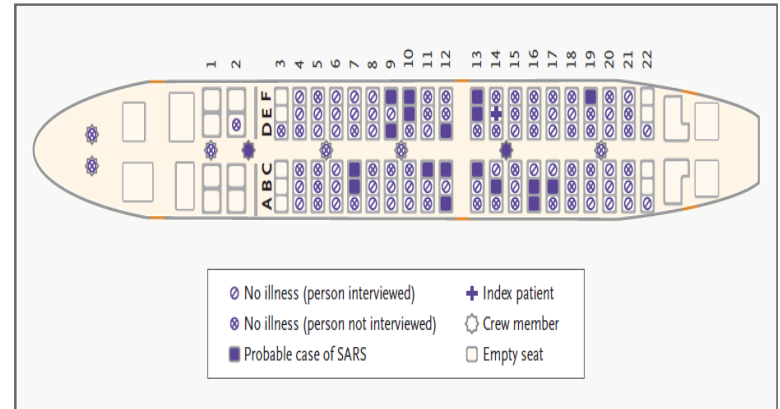
# What should States Consider—Comparative risk of outbreaks





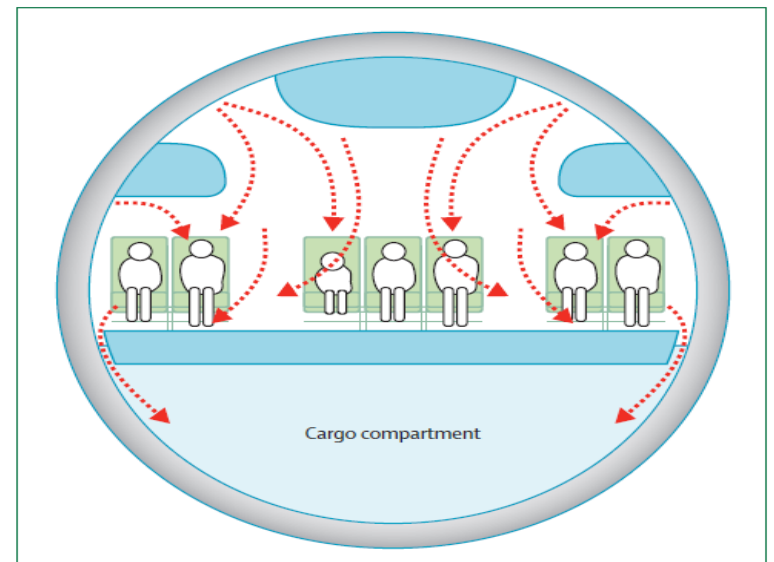
# What should States Consider—Comparative risk of outbreaks

- ▶ Effectiveness of exposure
  - Proximity to index case
- ▶ Infection-specific features
  - Virulence (severity of illness)
  - Fatality rate
- ▶ Public Health Interventions—Exit Screening in the Affected Area



**Figure 2.** Schematic Diagram of the Boeing 737-300 Aircraft on Flight 2 from Hong Kong to Beijing.

Two flight attendants and two Chinese officials also reportedly had illness that met the WHO criteria for a probable case of SARS. The flight attendants are shown here as members of the crew. The seat locations of the two Chinese officials are unknown, and they are not included in the diagram.



**Figure 1:** Air circulation pattern in typical airline passenger cabin  
From WHO<sup>4</sup> with permission of the publisher. Arrows show air currents.



[Auburn Home](#) > [OCM Home](#) > [Featured Story](#) > [Auburn researchers say harmful bacteria can survive for a week inside airliner cabins](#)



## Auburn researchers say harmful bacteria can survive for a week inside airliner cabins

Disease-causing bacteria can linger on surfaces in commercial airplane cabins for up to a week, according to an Auburn University study presented this week at the annual meeting of the American Society for Microbiology.



Kiril Vaglenov, a graduate student in Auburn's Department of Biological Sciences, conducted a two-year study—funded through the Federal Aviation Administration's Airliner Cabin Environmental Research Center—to determine how long *E. coli* O157:H7 and methicillin-resistant *Staphylococcus aureus*, or MRSA, would survive on commonly touched surfaces under typical airplane conditions. A major airline carrier supplied researchers with material from armrests, plastic tray tables, seat-pocket cloth, window shades and metal toilet buttons.

"Our data show that both of these bacteria can survive for days on these surfaces, particularly the porous material such as armrests and seat-pockets," said Vaglenov. "Air travelers should be aware of the risk of catching or spreading a disease to other passengers and practice good personal hygiene."

### Share This Story



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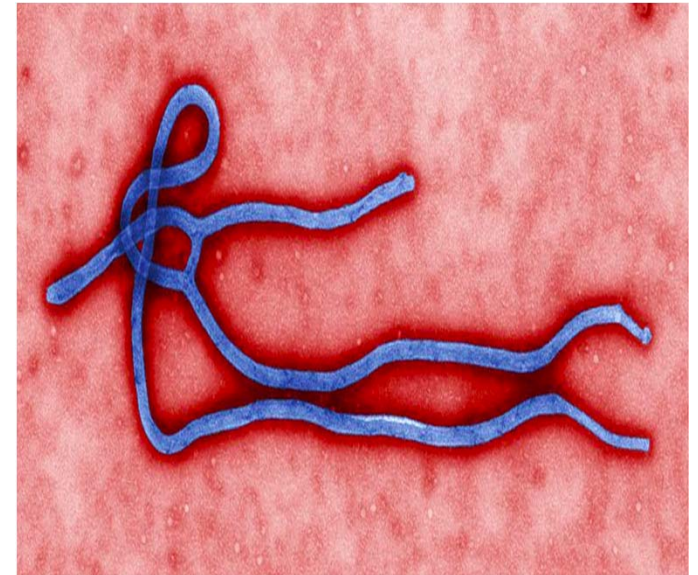
[Auburn's Aquaponics 101 workshop will give teachers new way to bring science into the classroom](#)  
5/30/2014

[Auburn University opens unique, world-class plasma physics research laboratory today](#)  
5/29/2014

# Factors that affect probability of disease transmission at Airports

Possible routes of infection include, and this may be affected by ventilation at the airports:

- ▶ Before boarding the aircraft
- ▶ En-route to the airport by public transport
- ▶ In line at the check-in counter
- ▶ Waiting in the gate area
- ▶ Access to the aircraft via “jet ways” or transport to the aircraft by bus
- ▶ Other crowded and confined spaces





# Factors that affect probability of disease transmission at Airports

Attributed to the following:

- Persons' close proximity to an infectious individual
- And the reduced level of ventilation compared with on-board ventilation.
- Possible routes of infection include:



# Pros & Cons of each Screening Tool

## Advantages

- ▶ Temperature displayed within seconds
- ▶ Non-Invasive
- ▶ Groups
- ▶ Reduce close contact with infected person
- ▶ Psychological re-assurance of the public



# Pros & Cons of each Screening Tool

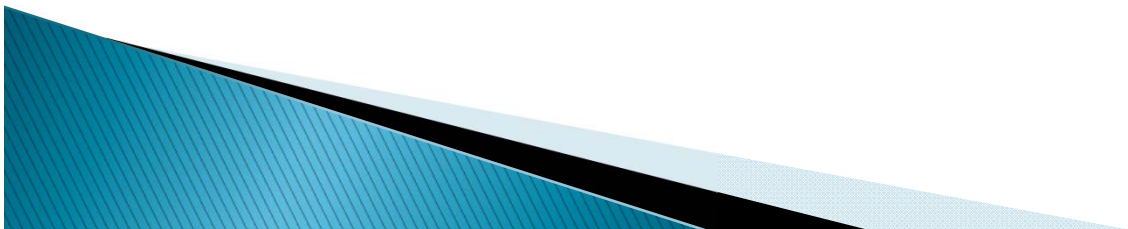
- ▶ Sensitivity .and Specificity
- ▶ Space Requirement/Human Resource
- ▶ Public may lose confidence
- ▶ Cost Benefit Analysis
- ▶ Passengers may take panado,ect
- ▶ Affected by environmental factors, settings, other factors
- ▶ It depends on the setting of the Scanner





# Pros & Cons of Each Screening Tool–Questionnaires

- ▶ Simple & Easily Reproducible
- ▶ Targeted vs Indiscriminate
- ▶ Process of Analysis & Follow-Up needs to be clearly defined
- ▶ Large amounts of information can be collected from a large number of people in a short period of time
- ▶ May be cost effective way
- ▶ There is no way to tell how truthful a respondent is being
- ▶ Wrong Contact Details-Hamper Follow-up Process
- ▶ There is no way of telling how much thought a respondent has put in.
- ▶ Asks only a limited amount of information without explanation



# Issues to Consider – Questionnaires Screening

- ▶ The results of the questionnaires can usually be quickly and easily quantified by either a researcher or through the use of a software package
- ▶ Can be analyzed more scientifically
- ▶ Challenges-Accommodate Different Languages
- ▶ Managed by Port Health Authorities to analyze
- ▶ Is argued to be inadequate to understand some forms of information - i.e. changes of emotions, behavior, feelings etc.
- ▶ Lacks validity
- ▶ Passengers may provide wrong contact details.

## Japan-Narita Airport

- Entry screening –search for febrile international passengers.
- Assess the feasibility to detect influenza cases based on screening as a sole measure.
- Entry screening –search for febrile international passengers.
- Sensitivity of fever(38.0C) for detecting H1N1 was estimated
- Diagnostic performance of thermal scanners in detecting fever at cut-off level 37.5C ,38.0 & 38.5 were estimated

## Results

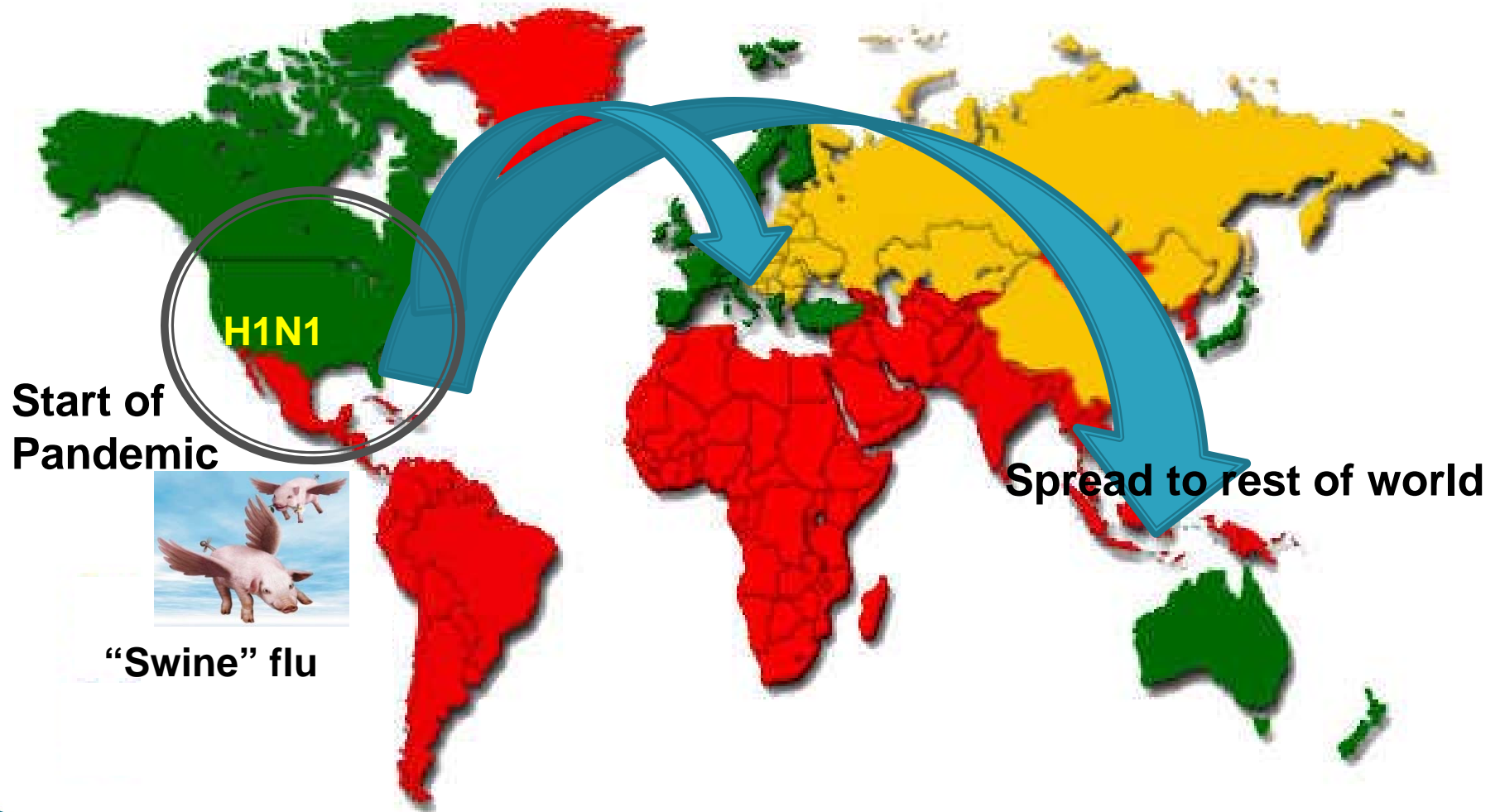
- Sensitivity of fever for detecting H1N1 –2009 case upon arrival was estimated to be 22.2%
- 55.6% of H1N1 cases were under antipyrexial medication.
- Sensitivity and specificity of scanners in detecting hyperthermia ranged from 50.7–70.4% & 63.6–81.7% respectively.
- Positive Predictive Value found to be low, at 37.3 –68.0%
- Limitations–Identified



New Zealand	Results
Screening was initially applied to all passengers using Visual Inspections, Questionnaires, Passenger Locator Cards, ect	April–June–2009–International Airports (n=456 518).
Initially focused on passengers from affected countries.	No identified as symptomatic and referred was 406(0.09%).
All flights had to notify NZ before landing on passenger & crew health.	ILI case definition met, swab taken & traveler isolated, 109(27%)
Aircraft was met by PHO who triaged the suspected cases.	Swab results obtained 89(82%), and those lost were 20 (18%)
PHO were stationed at a checkpoint, visual inspection for all passengers took place.	No not identified as symptomatic was (303)
	Swab RT-PCR Positive :n=4 (4%) and Swab RT-PCR Negative H1N1 n=85(96%)
Health Awareness at the Airport. Neither scanning or active screening of arriving passengers was used	<u>Conclusion</u> <ul style="list-style-type: none"> <li>Screening programme had a low sensitivity.</li> </ul>

Singapore–Travel Associated H1N1 – 2009	Results
In 2009, Singapore PHO implemented a containment plan	Only 12% case patients were detected by the thermal scanner
Passengers arriving at Int. Airports, underwent thermal scanning.	Suggested that thermal scanner detected 40% of those symptomatic patients.
All passengers with influenza-like symptoms were referred	
To a designated screening center for treatment and isolation.	
Investigators reported the 1 <sup>st</sup> 116 patients hospitalized with travel associated H1N1 infection	
Confirmed using PCR on respiratory samples	

# 2009: What Actually Happened



There is no evidence of increased illness in the pig population



# Screening for Infectious Diseases at International Airports: The Frankfurt Model Recommendation Exit Screening

Exit screening measures will be limited to passengers on international flights

- ▶ Passengers with paper tickets;
- ▶ Passengers with electronic tickets;
- ▶ “Meeters and greeters”; and
- ▶ Employees
- ▶ Passengers on Board an Aircraft

Medical Screening should take place before check in to avoid challenges with luggage.

- ▶ Thermal Scanners (sensitivity of 0.82 for the detection of fever) PV 0.99
- ▶ Questionnaires
- ▶ Visual Inspections
- ▶ Physical Examination
- ▶ Medical inspection (e.g., skin/eyes/throat/general condition).
- ▶ Medical Examination: specific to the typical symptoms associated with the specific agent).
- ▶ A back-up medical system will be installed in the terminal

# Lessons Learned from SARS/ H1N1 Ebola Screening

- ▶ Imported cases were identified through the local health care system after arrival
- ▶ Although the association between disease and temperature recognized
- ▶ Passengers may present with other symptoms such as cough, bruising, ect.
- ▶ No single screening measure that provides the requisite sensitivity and specificity



# Lessons Learned from SARS/ H1N1 Ebola Screening

- ▶ Screening is unlikely to identify 100% of ill travelers
- ▶ While some might use antipyretics to reduce a fever prior to passing through thermal scanners
- ▶ Or fail to report symptoms on declaration forms.
- ▶ Many individuals with subclinical or asymptomatic illness would not be identified, and could initiate outbreaks after arrival
- ▶ In Hong Kong, only one third of confirmed imported H1N1 cases were identified through screening on entry to Hong Kong





# Lessons Learned from SARS/ H1N1 Ebola Screening

- ▶ Transmissibility of the Disease
- ▶ Incubation period
- ▶ Flight Time
- ▶ Exit Screening by the affected country
- ▶ Ability of the affected country to contain the disease—Early International interventions
- ▶ Targeted od Indiscriminate
- ▶ Cost Benefit Analysis



# Lessons Learned from SARS/ H1N1 Ebola Screening

- ▶ Targeted Airlines vs Airports
- ▶ Entry screening in cities not receiving direct flights will be disruptive
- ▶ Indiscriminate entry screening of travelers on international flights would be highly disruptive, inefficient and impractical
- ▶ Exit screening of airports with greater traffic is more efficient than entry screening.



# Reasons States Imposing Public Health Measures

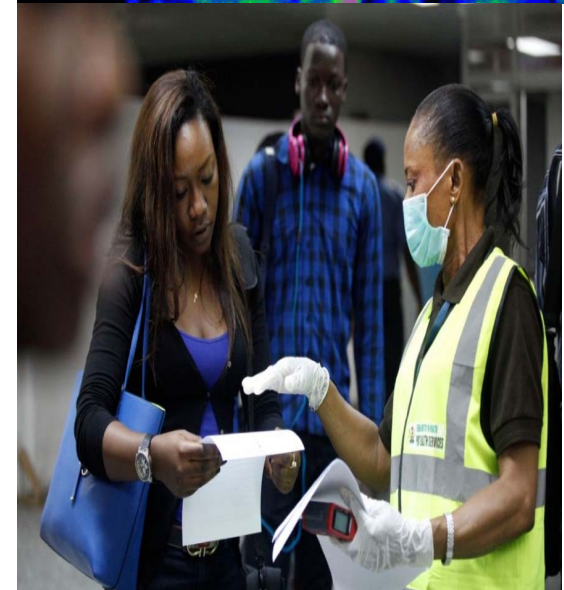
- ▶ Concern for potential for infectious disease inevitably spread across international borders.
- ▶ Concerns about local public health capacity interventions
- ▶ Which can be easily overwhelmed, particularly if resource limited
- ▶ Knee Jerk Response–Panic, Political & Economically Reasons not evidenced based
- ▶ Unilateral Decisions–Health Departments
- ▶ Travel restrictions will have a limited effect on the spread of infectious diseases
- ▶ Political and economic reasons, these restrictions will be very difficult to enforce





# Reasons Entry Screening Applied

- ▶ Purpose–Prevent the importation of a pathogen
- ▶ Or just to delay such importation and so “buy” a little time to enhance preparedness
- ▶ For geographically isolated infection free areas (islands)
- ▶ When epidemiological data indicates the need to do so;
- ▶ When exit screening at travelers' point of embarkation is suboptimal; and
- ▶ Where internal surveillance capacity in an outbreak area is limited.



# Exit & Entrance Screening

- ▶ Screening is unlikely to identify 100% of ill travelers
- ▶ The decision by States to screen should be clear, a prior articulation .
- ▶ No single screening measure that provides the requisite sensitivity and specificity -limitations
- ▶ A combination of measures may be required depending upon the prevailing situation (Singapore)
- ▶ Proactively communicate (including media) with Public about interventions measures (Screening, other to limit transmission & contain the disease)



**"That's  
all  
folks!"**

