Epidemic Risk Analysis
Informal Consultation

WHO Geneva, 21-22 March 2017
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Executive Summary

An informal consultation was organized by the Infectious Hazard Management (IHM) Department of the WHO Health Emergencies (WHE) Programme on 21-22 March 2017. The aim was to review progress to date and advise on next steps for elucidating an epidemic risk index to be used in anticipating and preparing for infectious disease outbreaks at country level. Thus far the composite index methodology used by the Index for Risk Management, or INFORM, (www.inform-index.com) has been employed to develop a preliminary model and analysis based on existing, open-source global databases. The consultation involved UN partners, global experts, and WHO staff from headquarters, regional and country offices. Participants worked in groups to review the relevance and appropriateness of indicators that were previously identified during an internal WHO workshop to develop a conceptual framework for infectious hazards.

The 47 expert participants represented diverse views and disciplines, from various agencies, academic, and public health institutions related to epidemics. The multidisciplinary approach enabled a rigorous review of the indicators in the conceptual framework and led to their classification according to INFORM dimensions of Hazard & Exposure, Vulnerabilities and Coping Capacities at country level. Each indicator was thoroughly considered in small working groups for its relevance, appropriateness and the assumptions/rationale supporting its inclusion/exclusion. This resulted in the validation of indicators by a wide group of multidisciplinary stakeholders. The expected outcome of this process is to ensure representative data and robust methods are employed in subsequent analyses.

Overall, the participants were supportive of the approach and methodology towards an epidemic risk tool that would provide countries and partner agencies with information about specific structural drivers of epidemics thereby enabling them to enhance preparedness and response measures. However, there is still work to be done in order to define and specify the statistical relationships of the indicators to be included in the model. Each of the working groups presented their version of the contributing indicators, which will inform further analyses and development of an epidemic risk model.
BACKGROUND

The world stands at a critical point. Epidemics of infectious diseases such as the recent outbreaks of Ebola, Middle East Respiratory Syndrome (MERS), Zika and other emerging and re-emerging diseases have shown their capacity to disrupt many dimensions of human existence. They can occur in one place but impact the entire world. Our ability to respond to infectious disease epidemics has tested the global community, not only in the field of public health but across all sectors of society.

Although we are aware of the broad impacts of epidemics in terms of morbidity and mortality, we are only just beginning to quantify and understand how these epidemics can have devastating impacts on socio-economics at the levels of family, community, society and country; indeed, the world. WHO, together with health and development global partners, have prioritized the development of proactive preparedness approaches to outbreak prevention, detection and response as opposed to just a reactive approach to outbreaks. This means that we need to better understand and manage the risk of epidemics rather than only firefighting them when they occur.

The department of Infectious Hazard Management (IHM) of the WHO Health Emergencies Programme (WHE) is leading a project on the analysis of epidemic risk for infectious hazards. The approach aims to understand the major risk factors that drive infectious disease outbreaks at country level which can be applied to undertaking an appropriate risk analysis. One concrete product we are aiming to develop is an epidemic risk model to broadly classify a country’s vulnerability to epidemics. The approach that has been selected is that used by the Index for Risk Management - known as the INFORM index - which is used widely by the global humanitarian community to track the risk of emergencies arising from natural disasters and conflicts. INFORM aims to include epidemics as a third type of humanitarian emergency and will eventually incorporate WHO’s work on epidemic risk.

As a first step, WHO undertook an in-house workshop in September 2015 and drafted a conceptual framework for infectious hazards, the primary objective of which was to identify generic risk factors and/or drivers of epidemics. WHO then used indicators that most accurately reflected the identified major drivers to develop a preliminary composite index model using for epidemic risk. The indicators were first classified into hazards, exposure, vulnerability and lack of coping capacity dimensions, following the INFORM methodology for a composite index.
PURPOSE AND OBJECTIVES

The purpose of this informal consultation meeting was to bring together global technical and subject matter experts to review and refine the methods, drivers, and associated indicators initially identified in the draft Conceptual Framework for Infectious Hazards. This process of validation by a wider, multidisciplinary audience was designed to provide feedback on the approach and to critically evaluate the relevance and appropriateness of the indicators identified thus far. It is expected that such a process will ensure that a robust approach is employed in subsequent analyses.

By developing an epidemic risk analysis methodology WHO aims to:
• Build common understanding of epidemic needs;
• Focus coordinated action on anticipating, preventing and preparedness for epidemics;
• Ensure rational resource allocation for epidemic prevention, preparedness, and response activities; and
• Be used as a tool to aid in the development of country and regional preparedness plans.

The meeting objectives were specifically:
• To orient participants on the draft Conceptual Framework for Infectious Hazards;
• To review indicators and assumptions for dimensions of hazard and exposure, vulnerability and coping capacity as defined in the INFORM index methodology;
• To review the preliminary epidemic risk analyses for selected key indicators; and
• To discuss and agree on next steps for further development of the indicators and methodology for an epidemic risk index.

PROCEEDINGS

Participants for this global informal consultation came from a variety of disciplines representing WHO HQ, regional and country office, global partner agencies and stakeholders, and subject matter experts with expertise relevant to epidemic-prone infectious diseases and modelling.

The structure of the meeting entailed plenary sessions with overview presentations and discussion plus group work sessions with plenary feedback. Topics presented in the first plenary session are described below.
INDEX FOR RISK MANAGEMENT, INFORM – OVERVIEW AND METHODOLOGY

A summary description and methodology of the INFORM process was presented by Andy Thow of OCHA and Luca Vernaccini of JRC, along with general principles of developing a composite index which aims to quantitatively represent a complex problem. The major benefit is that it allows for communication with different sectors/perspectives. Flexibility in the INFORM index is important so that it is adapted/shared resource for better common understanding of risk. The overall process of developing composite indices involves data treatment (e.g. imputation of missing data, treating outliers, etc.) to ensure comparability, normalization to transform to a non-dimensional scale, weighting and aggregation, and validation for statistical robustness including sensitivity balance, expert based conceptual validity, and model validity using historical data. A continuous review and improvement process is followed.

The selection of indicators is guided by the following criteria: reliable – measure what they claim to, open source, continuously collected, consistent – common measure or scale that is comparable, and have global coverage. Combining the indicators into one index follows the principle that strength in one compensates for weakness in another as they are complementary and represent the same concept from different angles. Combining indicators to indices can be done using geometric (when measuring very different things conceptually) versus arithmetic (exact compensation) aggregations. Cross-correlation is used to judge the relationships between indicators, for example: negative correlation – conflicting relationship; weak correlation – independent relationship; strong correlation – comparable relationship (i.e. measure is representative of the same indicator). The hierarchy within INFORM also uses an implicit weighting system.

Data that goes into the model has to be rigorous, reliable, sustainable. The work on indicators requires defining existing databases and data sources from which they will be extracted, dealing with missing information, poor proxies, and addressing prioritization, aggregation, assigning weights (ideally data-driven). INFORM has 50 normalized indicators that measure structural risk due to underlying factors. The INFORM country risk profiles are presented with 5 year trends and are updated retrospectively if there are changes to the model. The purpose of INFORM is to enable decision-making about the likelihood of emergencies through a shared/consultative process through reducing biases, correcting assumptions, or avoiding relationship misuse and it provides comparison for investment decisions.

Further details on INFORM can be found on their website: www.inform-index.org.
THE ROLE OF MODELLING IN EPIDEMIC FORECASTING

A presentation on quantitative risk assessment for emerging infections was made by Professor Neil Ferguson of Imperial College. He highlighted that frequency and severity/impact must be considered as separate entities in assessing risk. Virulence (as defined by case fatality rate or CFR), population at risk, attack rate for epidemic diseases are key epidemiological determinants that should be taken into account. It is worth noting that these are affected by both biological and societal factors.

Modelling has given insight into drivers for emerging infectious diseases (EIDs), especially those of zoonotic origin. A key area is evolutionary risk factors such as genomic analysis of species barriers. Understanding human behavioural factors is a necessary and growing research area but it is difficult to classify which behaviours affect transmission.

Tools for risk assessment include event/fault trees, network analysis, cluster analysis, and regression that have been used by the insurance industry. The World Bank’s new Pandemic Emergency Financing Facility uses event tree methods for “insurance layer pricing”. Even with rigorous quantitative risk assessment, uncertainty will always remain in predicting rare events, such as EID emergence, that are influenced by human factors.

DEVELOPMENT OF THE WHO CONCEPTUAL FRAMEWORK FOR INFECTIOUS HAZARDS

The conceptual framework for infectious hazards, which identified key risk factors driving outbreaks, was developed in a one-day, facilitated workshop with technical experts from various WHO departments. The areas of work represented included epidemic-prone diseases, vector-borne diseases, vaccine preventable diseases, research and development, the global influenza programme, the International Health Regulations, country preparedness support, risk communications, entomology, laboratory and surveillance, clinical care, and neglected tropical diseases.

The steps that led to an overall conceptual framework for infectious hazards that could be applied to country-level risk assessments were as follows:

- Step 1: Agree to categories for group work for epidemic diseases
- Step 2: Brainstorm on the most important drivers and risk factors for each group
- Step 3: Draw out common drivers across all groups
- Step 4: Identify indicators and articulate the assumptions and limitations associated with each indicator
- Step 5: Classify the indicators into: 1) hazard and exposure, 2) vulnerability and 3) coping capacity

The common epidemic drivers were then consolidated into a list with identification of appropriate indicators to measure each driver. These were used to discuss and generate the hierarchical relationships during the subsequent group work:

<table>
<thead>
<tr>
<th>Driver category</th>
<th>Driver Sub-categories</th>
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<tbody>
<tr>
<td>1. Pathogen</td>
<td>a. Transmission</td>
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<td>b. Virulence</td>
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<td></td>
<td>c. Presence/introduction</td>
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<td>2. Human Environment</td>
<td>a. Proximity to animals,</td>
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<td></td>
<td>b. Deforestation</td>
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<td>c. Infrastructure, WaSH</td>
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<td>d. Land use</td>
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<td></td>
<td>e. Reservoir host</td>
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<td></td>
<td>f. Animal husbandry</td>
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<td>3. Human Population</td>
<td>a. Health</td>
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<td>i. Nutritional status</td>
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<td></td>
<td>ii. Immunity</td>
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<td>b. Density</td>
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<tr>
<td></td>
<td>i. Urbanization</td>
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<td></td>
<td>ii. Vulnerability</td>
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<td></td>
<td>c. Movement</td>
</tr>
<tr>
<td></td>
<td>i. Migration</td>
</tr>
<tr>
<td></td>
<td>ii. Mass displacement</td>
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<td></td>
<td>iii. International travel</td>
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<tr>
<td>4. Behavior</td>
<td>a. Cultural practices</td>
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<td></td>
<td>b. Risky behavior</td>
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<td></td>
<td>c. Preventive health behavior</td>
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<tr>
<td>5. Health System</td>
<td>a. Healthcare facilities</td>
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<td></td>
<td>b. Access/outreach/whole population</td>
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<td></td>
<td>c. Vaccination programmes</td>
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<td></td>
<td>d. IPC</td>
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<tr>
<td></td>
<td>e. Surveillance</td>
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<td></td>
<td>f. Lab</td>
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<td></td>
<td>g. Interventions</td>
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<tr>
<td></td>
<td>h. Response</td>
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<tr>
<td></td>
<td>i. Human resources</td>
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<tr>
<td>6. Climate</td>
<td>a. Temperature</td>
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<tr>
<td></td>
<td>b. Rainfall</td>
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<tr>
<td></td>
<td>c. Drought</td>
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<td></td>
<td>d. Floods</td>
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DESIGN OF THE EPIDEMIC RISK INDEX MODEL AND PRELIMINARY ANALYSIS

Moving forward from the conceptual framework previously developed at WHO, an epidemic risk index model was designed using indicators taken from existing global datasets and a preliminary analysis was conducted using the INFORM methodology. The data generated from this preliminary analysis was presented as an epidemic risk index ranging from 0-10 for each country with higher score representing higher epidemic risk.

It was noted that the indicators included in the preliminary analysis represented a structural rather than a dynamic risk. As such, the process could help to identify which areas to focus preparedness efforts at country level and could be used accordingly by policymakers. As a tool to aid preparedness, it allows an organized approach to prioritize investment in interventions for countries and regions.

During the plenary discussion, the following key issues were noted about the use of composite indicators in general, and more specifically, the use of the INFORM methodology, when applied to epidemic-prone infectious diseases:

• This kind of multi-criteria risk index could potentially create a false sense of accuracy in the evaluation of low risk/high income countries. An example of the MERS-CoV outbreak in Republic of Korea was given, where a country that would rank as “high income” faces significant risk for an unknown/unfamiliar pathogens.

• It was recognized that taking inputs from the IHR data elements – either packaged together or separately, especially for the surveillance measures – will be important for incorporating in an epidemic risk model.

Construction of the model using the current INFORM methodology blurs the weighting of the indicators when combined, which is done intrinsically. It could be worth considering a more explicit assignment of weighting.

• It was clarified that this approach does not try to identify the risk of new diseases affecting human populations, rather it applies the state of knowledge to existing epidemic diseases with well-known interventions.

• The hazard dimension is the most problematic to define for infectious pathogens.

• The indicators that will eventually make up the epidemic index can be used individually as they constitute elements that are important drivers for propagating epidemics. As such, they represent aspects of structural risk that are made explicit and can be addressed by interventions.
• Malnutrition rates and immunization coverage can be taken as proxies for particularly vulnerable groups for infectious disease.

The graphic below presents the hierarchical Epidemic Risk Index and the dimensions and indicators.

ANALYSIS OF DETERMINANTS AND DRIVERS OF INFECTIOUS DISEASE THREAT EVENTS IN EUROPE

An analysis of drivers of infectious disease threats was presented by Dr Jan Semenza from ECDC based on a literature review, and incorporating internal ECDC datasets/reports was presented. The results of this review showed that global/environmental factors were the most important determinants in driving infectious diseases.

The EU has supported country focused assessments using the vulnerability and risk analysis & mapping platform (VRAM). The biggest challenge were data which are not always available, especially for the countries where they are most needed. Issues raised about using this methodology included the following which also apply to the approach:

• Threshold for inclusion – what constitutes an outbreak?
• In combining variables, it will be necessary to undertake subsequent modelling to determine which ones and the relationships between variables
• Directionality – cause versus effect, e.g. roads or health systems
• Ownership by countries will ensure results are adopted and applied, in order to make them partners

During the discussion the possibility of including the trust index was raised which gauges the population’s trust in four key institutions – government, NGOs, business and the media. A question was also raised about the validation of the trust index.
Review of the Conceptual Framework and draft list of indicators

Participants of the meeting were distributed into three groups to review and make recommendations on three dimensions of the INFORM model: hazard and exposure, vulnerability and coping capacity. The aim was to evaluate and refine the conceptual framework, the indicators, assumptions, and data sources outlined in the preliminary model.

Specific objectives of the group work were to:
1. Review the conceptual framework for infectious hazards and evaluate proposed indicators for each dimension;
2. Review and agree on the assumptions/rationale for each indicator; and
3. Propose a final set of indicators for each dimension to include in the model representing the epidemic risk index.

The outcomes of the group work were to review the indicators as follows:
1. All proposed indicators to be reviewed for each dimension considering their relevance and appropriateness
2. For each indicator, group consensus and description of the assumptions and rationale for relevance to the epidemic risk index
3. Agree on final sets of indicators and propose weighting based on appropriate assumptions
4. Outline next steps for completing the model.

The following section outlines the summary points from the discussion in each of the three groups and the indicators selected by the group for inclusion in the model are presented below each section.

Feedback on “HAZARD & EXPOSURE”

- There was a suggestion that “risk” had complicated meanings for different groups, particularly within the science of epidemiology; vulnerability might be a better word to use.
- Qualitative score
- Frequency vs severity should be considered separately because different factors drive each of these.
- Climate change cannot be used because of timescale mis-match
- Nesting of infectious disease threats within natural/human disasters could be considered.
- The group felt that diseases could be broken down into disease categories: such as: A) Zoonoses, B) Vector borne diseases, C) Diseases spread person-to-person, and D) Food/water borne diseases
A. Zoonoses + Vector Borne disease
- Existing framework/modelling for understanding these hazards
- Zika: Jones et al 2008 – peer reviewed maps exist
- Leverage existing products

B. Person to person /Food- and water-borne
- Climate, temperature, rainfall, water/sanitation/hygiene (WaSH)
- Important but not able to adequately address: community engagement/cultural practices. It was noted that "social capital" is a measure of power in social networks.
- Population mobility in spreading epidemics needs to be considered.
- Consider using DALY's for validation steps – how well does the framework describe DALYs?
- Release of biological threat/hazard intentionally – discussed but dropped
- Dependencies need to be addressed in the models to ensure they are more stable, vetted, expert-driven
- Biases of detection and surveillance
- Vulnerability versus exposure is different for epidemic diseases and disasters

During the plenary discussion it was necessary to highlight that in infectious disease parlance, exposure has a very specific meaning in the progression of disease. This is how it translates in INFORM terms:

**INFORM components:** Hazard & Exposure  Vulnerability

**Disease Progression:** Pathogen → Exposure → Infection → Disease
Feedback on “VULNERABILITY”

- The definition of risk versus vulnerability needs to be presented more clearly.
- Overlap between vulnerability and coping capacity exists as they are two sides of the same coin. It is therefore necessary to be explicit and avoid redundancy.
- Exposure vs vulnerability reflects onset vs. amplification
- Grouping of indicators should be based on prioritization criteria related to their impact.
- Disease-specific vulnerabilities by groups/categories (e.g. diseases grouped by modes of transmission) versus overall systematic vulnerabilities need to be articulated.
- Animal indicators that should be included are density of units and wildlife-specific indicators. These need further elaboration.
- Population level burden of disease including major infectious diseases (HIV, TB, malaria) as well as NCDs (diabetes, hypertension, cancer, ageing) need to be taken into account as a factor in vulnerability.
- Not only are epidemics a type of disaster, natural disasters themselves increase population vulnerability to infectious outbreaks. A way to resolve this two-way vulnerability element should be found.
- Socioeconomic vulnerabilities are major contributing factors to the spread of epidemics.

Feedback on “LACK OF COPING CAPACITY”

- IHR information needs to be incorporated but whether to use JEE vs annual self-assessment need to be considered given the potential for biased responses
- Surveillance in IHR is well defined – should use as disaggregated indicator
- Collaboration between human and animal health could be included with OIE-WHO One Health elements in the index.
• Selection of hospital beds as an indicator could address access issues: including urban-rural, financial, geographical, cultural constraints and surge capacity.
• The question of using density of nurses/midwives or just density of physicians was discussed.
• Measure of the health system access and capacity to prevent and respond to an outbreak included the following: public health expenditure; measles vaccine coverage; and number of maternal deaths.
• Certain indices were also considered: government effectiveness (World Bank index already in INFORM); corruption index vs transparency index as a trust measure; WaSH performance index.
• Use of Sendai Framework data was reviewed and considered better than IHR in terms of completeness and quality however, Hyogo Protocol is more about natural disasters so it does not apply.
• The issue of surge capacity for coping in epidemics needs further elaboration (e.g. ability to rapidly mobilize personnel, laboratory capacity, and emergency systems). Surrogate markers were suggested such as healthcare expenditure per capita.
• Capacity versus resilience measures was discussed.
CONCLUSIONS

The plenary discussions were rich and varied because of the breadth of perspectives amongst the diverse set of participants reflecting academic, research institutions, think tanks, UN agencies, and staff from all three levels of WHO in various relevant departments. In general, the participants agreed that a tool to understand factors contributing to epidemic risk was an important endeavour as the information would assist with improving overall country-level preparedness for responding to infectious disease outbreaks. The value of the INFORM methodology is in the global partnership and buy-in that comes with it which is why it was being considered as an approach to assessing epidemic risk. However, the participants felt that further discussion and exploration regarding the relationships between the indicator and disease risk is necessary before defining a model that is eventually adopted.

CONCEPTS AND PRINCIPLES

The participants agreed on the following elements and highlighted what needs to be considered and incorporated into the process of further development and finalization of the epidemic risk analysis.

- The group saw value in the conceptual framework as a starting point to further develop a risk model and outlined a number of next steps which would include:
  - Determining appropriate indicators for the drivers in the framework
  - Refining relationships between indicators and risk using real data
- Redundancy of several metrics may artificially prioritize certain indicators so explicit weighting needs to be considered – methodologies to be explored
- The focus is not on individual pathogens but groups of pathogens based on transmission
- Number of indicators – if too many, dilutes the information, so limit what is included based on the principle of parsimony
- Uncertainty (confidence intervals) must be factored in when possible
- Terminology needs to be clarified
- Focus of the index is not to predict the emergence of novel infectious pathogens but to serve as a risk-evaluation tool for existing diseases (e.g. YF, cholera, Ebola). Factors related to emergence (evolution of pathogens) as well as drivers/amplifiers of epidemics.
- Causality versus correlation must be clarified
- This is not a predictive model for a single disease event
- Weighting of indicators based on modelling etc.
- Further work is required in reviewing indicators and finding appropriate data
- Further discussion/evaluation of IHR measurements to be included
- Clarify how is this tool going to be used at global/country level
- Balanced indicators but more sensitive than specific
- Disaggregation to subnational levels should be considered, especially big countries

Some remaining non-technical questions to be dealt with include: How are we going to advocate for this tool? When is this going to see the light? Timeliness is important but so is quality. Validation – how will we prove that it works? What study designs should be used?

NEXT STEPS IN THE PROCESS

A number of participants want to remain involved in taking this work forward with WHO and will be invited to constitute a technical advisory group.

The following steps are envisioned for finalizing the approach to epidemic risk analysis:
- Finalization of indicators, assumptions, components based on participant feedback and finalized indicators and assumptions.
- Follow through on statistical analyses proposed to update the current version of the methodology
- Verify data sources, collate and compile data, and conduct analysis

WHO will also engage with the INFORM group for methodological inputs and to plan on how epidemic risk could be incorporated into the INFORM index itself.
## ANNEX 1: Agenda

### Day 1: 21 March 2017

<table>
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<tr>
<th>Sessions</th>
<th>Topic</th>
<th>Presenter/Facilitators</th>
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<tbody>
<tr>
<td><strong>Morning session: 09:00-12:00 Chaired by Ronald K Saint John</strong></td>
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<tr>
<td>08:30-09:00</td>
<td>Registration</td>
<td>IHM Secretariat</td>
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<tr>
<td>09:00-09:10</td>
<td>Opening Remarks</td>
<td>Nahoko Shindo, WHO</td>
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<td>09:10-09:30</td>
<td>Introduction of Participants</td>
<td>Participants</td>
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<td>09:30-09:45</td>
<td>Overview of Index for Risk Management (INFORM)</td>
<td>Andrew Thow, OCHA</td>
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<td>09:45-10:15</td>
<td>The INFORM Methodology</td>
<td>Luca Vernaccini, JRC</td>
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<tr>
<td>10:15-10:30</td>
<td>DISCUSSION</td>
<td>Participants</td>
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<td>10:30-11:00</td>
<td>Coffee Break</td>
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<td>11:00-11:15</td>
<td>Epidemic Forecasting: The Role of Modelling</td>
<td>Neil Ferguson, Imperial College</td>
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<td>11:15-11:30</td>
<td>Conceptual Framework for Infectious Hazards</td>
<td>Asheena Khalakdina, WHO</td>
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<td>11:30-11:45</td>
<td>Epidemic Risk Index: Methods and Preliminary analysis</td>
<td>Jaya Lamichhane, WHO</td>
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<td>11:45-12:15</td>
<td>DISCUSSION</td>
<td>Participants</td>
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<td>12:15-12:30</td>
<td>Introduction Group Work</td>
<td>Asheena Khalakdina</td>
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<td>12:30-13:30</td>
<td>Lunch</td>
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<td><strong>Afternoon session: 13:30-17:30 (Coffee Break 15:00 –15:30)</strong></td>
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<tr>
<td><strong>Group Work I: Validating Indicators</strong></td>
<td>Review draft conceptual framework and evaluate proposed indicators for Hazard &amp; Exposure, Vulnerability and Coping Capacity dimensions</td>
<td>Participants Facilitated by Jaya/Luca/Andrew/</td>
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### Day 2: 22 March 2017

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Facilitator</th>
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<tbody>
<tr>
<td>09:00-09:15</td>
<td>Review Day 1</td>
<td>Jaya Lamichhane</td>
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<tr>
<td>09:15-10:30</td>
<td><strong>Plenary Feedback: Group Work I</strong></td>
<td>Group Representatives</td>
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<td>• Plenary presentations according to <strong>expected outcomes</strong> of the group work (15')</td>
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<td>• Feedback and discussion in plenary on proposed indicators</td>
<td>Participants</td>
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<tr>
<td>10:30-11:00</td>
<td>Coffee Break</td>
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<tr>
<td>11:00-12:30</td>
<td><strong>Group Work II: Populating the Indicators</strong></td>
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<td><strong>Group Work II</strong></td>
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<td><strong>Objectives:</strong></td>
<td>Participants</td>
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<td>1. Review and agree on the assumptions/rationale for each indicator; and</td>
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<td>2. Propose set of indicators for each dimension to include in epidemic risk analysis model</td>
<td>Facilitated by Jaya/ Luca/Andrew/Anneli/Raymond</td>
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<tr>
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<td>o Develop components for indicators</td>
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<td>o Select data sources and dataset for each indicators including identification of issues</td>
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<tr>
<td>12:30-13:30</td>
<td>Lunch Break</td>
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<tr>
<td>13:30-15:30</td>
<td><strong>Plenary Feedback: Group Work II</strong></td>
<td>Group Representatives</td>
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<td>• Describe proposed indicators and their relevance to each component and respective dimension (15')</td>
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<td>• Discussion and recommendations on the identified issues and gaps</td>
<td>Participants</td>
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<tr>
<td>15:00 –15:30</td>
<td>Coffee Break</td>
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</table>

**Wrap-up session: Chaired by Amadou Sall**
ANNEX 2: List of Participants

GLOBAL EXPERTS

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