Scenarios for a further increase in the spread of 2019-nCoV

Background and considerations

On 31 December 2019, a cluster of pneumonia cases of unknown aetiology was reported in Wuhan, Hubei Province, China. The causative agent was identified as a novel coronavirus (2019-nCoV), which has since then infected thousands of people.

The clinical presentation of 2019-nCoV infection ranges from asymptomatic to very severe pneumonia with acute respiratory distress syndrome, septic shock and multi-organ failure, which may result in death. The first case series of reported cases likely represent a sample of severe cases and the overall severity of disease (proportion of mild vs. serious cases) remains unknown. However, there is increasing evidence that patients with mild disease (that may not seek health care) could be efficient spreaders of the virus (e.g. the German cluster).

The cases currently reported in China probably represent the tip of an iceberg of unknown size, since milder cases are less likely to be tested. Imperial College estimates that case detection in China is 10% and outside China, where the caseload is lower, 25%[1]. The spectrum of disease severity is yet unknown, but, as there is an ascertainment bias towards testing severe cases, there is likely an overestimation of the severity and case fatality rate in the first case series from China. Analysis by ECDC of the reported spread in Chinese provinces outside Hubei suggests a situation very similar to the earlier stages of the Wuhan epidemic, but with one to three weeks' lag time, depending on the setting. As the population movement from Wuhan has stopped, this points to a widespread community transmission in mainland China, outside Hubei.

China's Belt and Road Initiative (BRI), sometimes referred to as "the New Silk Road", is one of the most ambitious infrastructure projects ever conceived. This initiative means a substantial Chinese presence and investments in more than 70 countries, many of those with poor healthcare infrastructure and few opportunities to identify a potential introduction of 2019-nCoV. Air traffic to and from China has also increased dramatically over the past years, reaching an average flight volume from China to the EU of approximately 495,000 passengers per month.

Since the end of January 2020, a number of EU/EEA airlines have restricted the number of direct flights to China. However, some direct flights continue and, facing restricted options, many travellers may choose indirect routes. It is reasonable to assume that travellers from areas with reported cases of nCoV, both within and outside China, have continued to arrive in Europe. On repatriation flights from Wuhan to Germany and Japan between the 29th January and 1st February 2020, roughly 1 passenger in 100 had a detectable nCoV infection. Passengers leaving Wuhan before travel restrictions were implemented would have had a lower risk of exposure. As of 6th February, there are four Chinese cities (Zhejiang, Guangdong, Hunan and Henan) that report between 20% and 30% as many cases as were recorded in Wuhan on the day the repatriation flights started to leave. A simplistic inference would suggest that one traveller in every 300 to 500 leaving these cities on the 6th February would have a

[1] youtu.be/ALQTdCYGISw

detectable infection. Furthermore, the case doubling rate is estimated to be six days implying that, on any given route from an affected area, the risk of importation will also double every six days, assuming no further travel restrictions are implemented.

As of 6th February, there have been 35 separate reports of cases imported from China into a total of 22 countries. Modellers at Harvard have suggested that some countries (e.g. Thailand and Indonesia) are reporting fewer importations than would have been expected, given the air passenger volumes[2]. The probability of an imported introduction causing a large outbreak depends on characteristics of the virus and on the implementation of control measures, such as active case finding. Analysis from the London School of Hygiene & Tropical Medicine suggests that, in the absence of such interventions, the importation of three cases would have a 50% chance of starting an outbreak with ongoing transmission[3].

Implications for Europe

Further European cases may therefore occur due to a) importation from China, b) importation from other countries, including Asia and Africa (where China is heavily present) or c) onwards transmission from unidentified importation. Since the incubation period may be up to 14 days, it is possible that travellers who arrived in Europe before travel restrictions were implemented may still not have developed symptoms. Mild and asymptomatic cases may also remain undetected.

At present, testing routines in Europe will only detect cases from China and known contacts. Transmission within Europe from unidentified importations will only be detected if heightened awareness leads to the testing of unusual single cases or clusters of viral pneumonia in patients with no known link to China.

Given the context outlined above, it is feasible that the number of cases detected in Europe may increase rapidly over the days and weeks to come, as it is in Asian cities. In order to facilitate preparedness, we characterise four potential scenarios for Europe:

1. Ongoing containment
2. Sustained but sporadic community spread
3. Widespread sustained transmission with increasing pressure on healthcare system
4. Widespread sustained transmission with healthcare systems that are unable to cope

For the first three of these scenarios (i.e. scenarios 1, 2 and 3), updated clinical details from cases reported to TESSy are of utmost interest to provide us with a more unbiased understanding of disease severity.

The four scenarios are described in the table below in terms of:

a) How they are characterised
b) Factors that could affect the probability of moving us to the next scenario
c) Response measures to be considered by the EU/EEA Member States

[2] https://www.medrxiv.org/content/10.1101/2020.02.04.20020495v1.external-links.html
[3] https://www.medrxiv.org/content/10.1101/2020.01.31.20019901v1.full.pdf

Table - Foreseen scenarios for Europe, options for public health action and factors affecting probability of moving to next scenarios

Scenarios (for Europe)	Characterisation	Risk management options	Guidance documents	Factors that increase the probability of moving to next scenarios (critical events)
1. Ongoing containment	Multiple introductions and limited human-to-human transmission in Europe. The number of introduction remains limited. No sustained transmission (only 2nd generation cases observed in Europe) or transmission within sporadic contained clusters with known epi links.	Active case finding (including testing of severe acute respiratory infections with no link to risk areas and/or testing of ILI) with continued analysis regarding travel to China and possible other countries of transmission; contact tracing; isolation of cases; ICP measures in healthcare setting; non-pharmaceutical countermeasures; review of pandemic preparedness plan (in particular crisis management system, existing and surge healthcare capacity awareness, essential services and business continuity); risk communication in accordance with epidemiological developments	- Case definition and European surveillance for human infection with novel coronavirus (2019-nCoV) - Coronavirus Factsheet for health professionals - Public health management of persons having had contact with novel coronavirus cases in the European Union - Algorithm for management of contacts of probable or confirmed 2019-nCoV cases - Guidelines for the use of non-pharmaceutical measures to delay and mitigate the impact of 2019-nCoV - Interim guidance for environmental cleaning in non-healthcare facilities exposed to 2019-nCoV - Personal protective equipment (PPE) needs in healthcare settings for the care of patients suspected or confirmed with 2019-nCoV - Guidance on community engagement for public health events caused by communicable disease threats in the EU/EEA	Moving to next scenario: - Increase in number of cases reported through TESSy without known epi link to affected area(s) or to imported cases - Significant increase in number of cases reported outside China, suggesting a sustained human-to-human transmission - Sustained human-to-human transmission described outside China - Increase in number of cases reported in China and outside China increasing pressure of introduction in Europe, particularly if disease affects large city with sub-optimum surveillance and response capacity - Super spreader events are described in and/or outside China - Transmission during large mass gathering events

			- Advice for travellers on the outbreak of 2019-nCoV	
2. Sustained but sporadic community spread	Multiple introductions and local reports of sustained human-to-human transmission (cases of >2nd generation outside of sporadic contained clusters with known epi links). High number of introduced or second generation cases.	Active case finding (including testing of severe acute respiratory infections with no link to risk areas and/or testing of ILI) with continued analysis regarding travel to China and possible other countries of transmission; contact tracing; continued full surveillance reporting to TESSy; non-pharmaceutical countermeasures including social distancing; activation of preparedness pandemic plan (in particular crisis management system, existing and surge healthcare capacity awareness, essential services and business continuity); risk communication in accordance with epidemiological developments	- Case definition and European surveillance for human infection with novel coronavirus (2019-nCoV) - Coronavirus Factsheet for health professionals - Public health management of persons having had contact with novel coronavirus cases in the European Union - Algorithm for management of contacts of probable or confirmed 2019-nCoV cases - Guidelines for the use of non-pharmaceutical measures to delay and mitigate the impact of 2019-nCoV - Interim guidance for environmental cleaning in non-healthcare facilities exposed to 2019-nCoV - Personal protective equipment (PPE) needs in healthcare settings for the care of patients suspected or confirmed with 2019-nCoV - Guidance on community engagement for public health events caused by communicable disease threats in the EU/EEA - Advice for travellers on the outbreak of 2019-nCoV	Moving to next scenario: - Significant proportion of cases reported through TESSy without known epi link to affected area(s) or to imported cases in two or more countries - Significant increase in number of cases reported in Europe, suggesting a sustained human-to-human transmission - Sustained human-to-human transmission described in Europe - Super-spreader events are described in Europe - Transmission during large mass gathering events - Outbreaks reported simultaneously in various regions in European countries and Europe in general

3. Widespread sustained transmission with increasing pressure on healthcare system	Localised outbreaks start to merge, become indistinct with wide-spread of the virus and sustained human-to-human transmission in Europe (cases of >2nd generation outside of sporadic contained clusters with known epi links). Increasing pressure on healthcare services	Implementation of pandemic preparedness plan; simplified reporting (e.g. travel history simplified or left out); combined reporting with influenza; non-pharmaceutical countermeasures including social distancing ; risk communication in accordance with epidemiological developments	- Guidelines for the use of non-pharmaceutical measures to delay and mitigate the impact of 2019-nCoV - Infection prevention and control for the care of patients with 2019-nCoV in healthcare settings - Advice to healthcare workers on management of patients with 2019-nCoV infection - Interim guidance for environmental cleaning in non-healthcare facilities exposed to 2019-nCoV - Personal protective equipment (PPE) needs in healthcare settings for the care of patients suspected or confirmed with 2019-nCoV - Guidance on community engagement for public health events caused by communicable disease threats in the EU/EEA	Moving to next scenario: - Other epidemics (e.g. seasonal influenza) are occurring at the same time - Potential SoHO donors are deferred and there is a shortage of SoHO supplies - The disease affects mainly vulnerable groups which would require a higher level of care (e.g. hospitalisation) - There is a shift in the severity of the disease and more people would require a higher level of care - The number of 2019-nCoV related death is increasing indicating a higher need of care for the patients - Several events of nosocomial transmissions are reported in the EU, highlighting a higher level ICP measures or higher adherence to the ICP measure, increasing pressure on the HCW - Higher rate of infection among HCW, decreasing the workforce in the healthcare setting
4. Widespread sustained transmission with healthcare system unable to cope	Over-burden of healthcare systems (overflowing emergency rooms, strained ICU capacity, HCW overworked)	Implementation of pandemic plan; combined reporting with influenza; non-pharmaceutical countermeasures including social distancing; risk communication in accordance with epidemiological developments	- Guidelines for the use of non-pharmaceutical measures to delay and mitigate the impact of 2019-nCoV - Interim guidance for environmental cleaning in non-healthcare facilities exposed to 2019-nCoV - Infection prevention and control for the care of patients with 2019-nCoV in healthcare settings	Return to previous scenario: - Concomitant epidemics are fading away - 2019-nCoV cases decrease due to seasonality - Immunity is building up among the community - If not all European countries are affected at the same time, a shift in resources/capacities could be organised

			- Advice to healthcare workers on management of patients with 2019-nCoV infection - Personal protective equipment (PPE) needs in healthcare settings for the care of patients suspected or confirmed with 2019-nCoV - Guidance on community engagement for public health events caused by communicable disease threats in the EU/EEA	

The following critical elements of pandemic preparedness plans should be reviewed and considered already in the first two scenarios, in particular concerning:

- Crisis management system (ready to be activated if needed):
    - Lines of command and control should be based on existing structures and mechanisms as described in the National pandemic plan
    - The plan should anticipate how these may change during the response according to the actual severity and impact of the emergency
    - In complex emergency of uncertain severity and duration involvement of health and non-health sectors at all administrative levels might be required
    - Lines of communication within the crisis management structure and with relevant outside stakeholders and sectors should be tested to ensure a coordinated response
    - Crisis team to receive regular reports on capacities in the healthcare sector (primary, secondary and higher level care), stockpiles, use and distribution of medical countermeasures (essential drugs, equipment for mechanical ventilation and oxygenation) and other supplies
- Existing and surge healthcare capacity awareness:
    - Ensure the continuation of regular and emergency services while providing appropriate clinical care for cases, whether these present to primary healthcare, are hospitalised or admitted to critical or intensive care units (ICUs).
    - Primary and secondary healthcare facilities will experience a significant increase in the number of respiratory patients (in addition to the usual number of ill persons during seasonal influenza period) while healthcare workers may also become ill and so be absent from work.
    - There might be an excess demand for healthcare services with potentially fewer healthcare workers to deliver these services. In addition to limited staff, other resources will be stretched, including beds, medicines and mechanical ventilators, and this may last for several months.
    - Even if the proportion of severe cases is lower than initial estimates from China, it is conceivable that co-circulation with seasonal influenza would add to the pressure on hospital capacity. Bed occupancy rates should be closely monitored.
    - Hospitals may face a situation where it is necessary to discharge non-critical patients to free up resources for severely ill patients and to cancel planned non-urgent treatments.
    - All healthcare professionals should be briefed with respect to emergency response arrangements in their facility, their obligations, responsibilities and rights.
    - Update plans for surge capacity that estimate the capacities required to deal with the emergency of different severities and thus numbers of severe cases. Use indicators for filling or exceeding existing capacity and for triggering arrangements to increase capacity at the local/healthcare facility level
- Essential services and business continuity:
    - Business continuity plans should be updated and available for key healthcare providers and public health stakeholders.
    - All essential sectors should be involved to ensure business continuity of their services to provide input to the health care functioning.
    - As part of general healthcare services management, countries should maintain an inventory of existing capacities, including both public and private healthcare facilities, number of hospital beds, ICU beds, equipment and medicines for the

treatment of severe cases, staffing and options for surge capacity (e.g. retirees, medical students, etc.)

Risk communication activities should be performed in accordance with the epidemiological situation to:

- Ensure early and transparent communication to the population on the public health strategy adopted by the country, and on the reasons for any strategic changes that may emerge over the course of the epidemic
- Emphasise the importance of compliance with public health measures, including those that involve restrictions that may affect personal freedom
- Ensure alignment of messages between the different organisations and sectors involved
- Provide comprehensive information about protective measures that people can take, both for themselves and for the community
- Provide regular updates on advances in treatments, vaccines and other preventive measures, including any unknowns and progress in solving these
- Highlight the importance of accessing reliable sources of information so as to mitigate the spread of rumours and fears

Conclusions

As of 6th February 2020, based on the characterisation detailed above, the situation currently fits the first scenario: ongoing containment. Therefore, given the dynamic evolution of the global context, we strongly encourage Member States of the EU/EEA to review their pandemic plans and prepare for the eventuality of progression to further scenarios, as described above. Measures to delay progression to the next scenarios will be important.

Uncertainties remain regarding the epidemiology of 2019_nCoV, mobility patterns and detection rates. Nevertheless, given the current knowledge and understanding, it is clear that action should be taken to prepare and co-ordinate efforts to protect the health of European citizens in compliance with Decision 1082/2013/EU on serious cross-border threats to health. Sharing updated clinical information of all cases from different Member States may help better understand the spectrum of severity of the disease and enable a more effective response. Risk communication activities, in accordance with the epidemiological situation, are also of primary importance at any stage in order to avoid un-necessary panic or stress-related reactions in the general population and to provide clear and timely guidance.

ECDC is providing assessment of risk, monitoring the epidemiological situation and coordinating modelling work to guide evidence-based decision-making, including analysis of:

- Effectiveness of entry screening at airports
- Optimisation of contact-tracing
- Potential impact of social distancing measures to interrupt transmission or relieve pressure on healthcare services
- Potential for spread within Europe and implications for risk groups and healthcare services
- Adapting healthcare services to adapt to surge pressure

ECDC also provides updates and guidance on the following:

- Coronavirus specific section of ECDC website including Q&A for the general public: https://www.ecdc.europa.eu/en/novel-coronavirus-china and https://www.ecdc.europa.eu/en/novel-coronavirus-china/questions-answers
- Case definition and European surveillance for human infection with novel coronavirus (2019-nCoV): https://www.ecdc.europa.eu/en/case-definition-and-european-surveillance-human-infection-novel-coronavirus-2019-ncov
- Current Risk Assessment on the novel coronavirus situation: https://www.ecdc.europa.eu/en/current-risk-assessment-novel-coronavirus-situation
- Coronavirus Factsheet for health professionals: https://www.ecdc.europa.eu/en/factsheet-health-professionals-coronaviruses (30 January 2020)
- Public health management of persons having had contact with novel coronavirus cases in the European Union: https://www.ecdc.europa.eu/en/publications-data/public-health-management-persons-having-had-contact-novel-coronavirus-cases including an algorithm for management of contacts of probable or confirmed 2019-nCoV cases: https://www.ecdc.europa.eu/en/publications-data/algorithm-management-contacts-probable-or-confirmed-2019-ncov-cases (30 January2020)
- Infection prevention and control for the care of patients with 2019-nCoV in healthcare settings: https://www.ecdc.europa.eu/en/publications-data/infection-prevention-and-control-care-patients-2019-ncov-healthcare-settings (2 February 2020)
- Advice for travellers on the outbreak of 2019-nCoV: https://www.ecdc.europa.eu/en/publications-data/advice-travellers-outbreak-novel-coronavirus-2019-ncov (30 January 2020)
- Advice to healthcare workers on management of patients with 2019-nCoV infection: https://www.ecdc.europa.eu/en/publications-data/advice-healthcare-workers-management-patients-2019-ncov-infection (30 January 2020)

The following additional documents are about to be published:

- Guidelines for the use of non-pharmaceutical measures to delay and mitigate the impact of 2019-nCoV
- Interim guidance for environmental cleaning in non-healthcare facilities exposed to 2019-nCoV
- Personal protective equipment (PPE) needs in healthcare settings for the care of patients suspected or confirmed with 2019-nCoV
- Guidance on community engagement for public health events caused by communicable disease threats in the EU/EEA

ECDC actively communicates and collaborates with key stakeholders such as the European Commission and Member States, other Centres for Disease Control and peer organisations such as the World Health Organisation.