Surveillance Strategies
for COVID-19 Human Infection

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World Health Organization

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For more information: www.cdc.gov/COVID19
SURVEILLANCE STRATEGIES FOR COVID-19 INFECTION

Dr. Anne Perrocheau
Technical lead for Surveillance
Incident Management Support Team for COVID-19 response
World Emergency Program
Geneva
Surveillance of COVID-19 human infection: national surveillance

- Objectives of national surveillance:
  - enable **rapid detection**, isolation, testing, and management of suspected cases
  - identify and **follow up contacts**
  - guide the implementation of **control measures**
  - detect and contain outbreaks among **vulnerable** populations
  - evaluate the impact of the pandemic on **health-care systems and society**
  - monitor longer term **epidemiologic trends** and evolution of COVID-19 virus
  - understand the **co-circulation** of COVID-19 **virus**, influenza and other respiratory viruses
WHO recommended strategies for national Surveillance

1. **Strengthen** existing surveillance capacities
   - adapt existing surveillance systems
   - COVID-19 as a mandatory notifiable disease
   - immediate reporting

2. Scale-up of **additional** surveillance capacities as needed
   - in community: EWAR system, community surveillance, event based surveillance, participatory surveillance
   - in vulnerable groups: EWAR, active case finding, daily clinical check, zero reporting

3. Use **innovative** technologies for surveillance
   - digital/electronic technologies for rapid reporting, data management, and analysis
   - Apps for contact tracing, hotlines, self reporting platform
## Type of surveillance and surveillance sites for COVID-19

<table>
<thead>
<tr>
<th>Type of Surveillance</th>
<th>Individuals in the Community</th>
<th>Primary Care Sites</th>
<th>Hospital</th>
<th>Sentinel ILI/SARI Site</th>
<th>Residential Facilities and Vulnerable Groups</th>
<th>Vital Statistics Offices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Case notification system</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Contact tracing system</td>
<td>X</td>
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<tr>
<td>Sentinel virus surveillance</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sentinel case surveillance</td>
<td>(X)</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Cluster investigations</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Special settings surveillance</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Mortality surveillance</td>
<td>X</td>
<td></td>
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<td>X</td>
</tr>
</tbody>
</table>
Surveillance sites - 1

• Community
  – Community and event based surveillance
  – Contract tracing, cluster investigation
  – Participatory surveillance, telephones hotlines, self reporting platform

• Primary care level
  – Probable and confirmed cases
  – 24 h notification
  – Zero reporting
  – Limited set of data (age, sex, date onset, date sample, test result, location testing site)
Surveillance sites - 2

• Hospital
  – Probable and confirmed cases
  – Minimum data set: age, sex/gender and place of residence, date of onset, date of sample collection, date of admission, laboratory test result, severity on admission: admitted to intensive care unit (ICU), treated with ventilation, health care worker status, outcome (discharge or death) if follow-up report feasible.

• Global Influenza Surveillance and Response System
  – For ILI and SARI
  – Community transmission
  – Virological surveillance and Sequencing
Surveillance sites - 3

• Vulnerable groups: residential facilities, closed settings
  – Active case finding, daily screening
  – zero reporting
  – Health care workers: clusters investigation, specific study

• Humanitarian settings
  – EWAR, community surveillance
  – Active case findings
  – Identification of high risk individuals

• Mortality surveillance
  – Case based surveillance daily, weekly reporting
  – Religious centers, burial sites
  – Vital statistics
THANK YOU FOR YOUR ATTENTION
Overview of Surveillance Strategies for COVID-19 Outlined in WHO Guidance

Operationalizing guidance to review objectives and indicators by surveillance strategies

Veronica Pinell-McNamara
Epidemiologist
Division of Bacterial Diseases
National Center for Immunization and Respiratory Diseases
Centers for Disease Control and Prevention
Outline

- Objectives of the surveillance
- Short- and long-term goals
  - Review indicators from each
- Surveillance systems
  - How systems can meet those objectives
  - Indicators each can get from each
- Considerations for incorporating COVID-19
Short-Term Objectives

- Characterize the outbreak to guide control measures and limit spread of disease
  - Enable rapid detection, isolation, testing and management of suspected cases
  - Identify and follow up contacts
  - Detect and contain outbreaks among vulnerable populations
  - Guide the implementation of control measures
Short-Term Indicators

- Weekly reporting to WHO by age and sex:
  - # new confirmed cases
  - # deaths in confirmed cases (case fatality rate)
  - # new confirmed cases hospitalized (general and intensive care unit [ICU], if available)
  - # confirmed cases discharged or recovered
  - # persons tested for COVID-19
Long-Term Objectives

- Monitor longer term epidemiologic trends and evolution of COVID-19 virus
- Evaluate the impact of the pandemic on health-care systems and society
- Understand the co-circulation of COVID-19 virus, influenza, and other respiratory viruses
Indicators to Monitor Longer Term Epidemiologic Trends and Evolution of COVID-19

- Overall and weekly regional trends (by age, sex, race)
  - # confirmed COVID-19 cases by subnational levels
  - Incidence rates (general and by subnational levels)
  - % SARS-CoV-2 cases out of hospitalized severe acute respiratory infection (SARI)
  - % SARS-CoV-2 cases out of outpatient influenza-like illness (ILI) cases
Indicators to Monitor Longer Term Epidemiologic Trends and Evolution of COVID-19

- Changes in deaths (by region, age, sex, and race)
  - # deaths in confirmed cases (case fatality rate)
  - # confirmed COVID-19 deaths among hospitalized (hCFR (%))
  - # deaths of COVID-like illness (pneumonia, ILI/SARI and other, including country or geography specific conditions)
  - Estimate of excess all cause mortality (the degree to which currently measured mortality exceeds historically established level)
Indicators to Monitor Longer Term Epidemiologic Trends and Evolution of COVID-19

- Changes in risk factors or co-morbidities (by region, age, sex)
  - % cases with risk factors (by underlying conditions or co-morbidity)
  - % deaths with risk factors (by underlying conditions or co-morbidity)
Indicators to Evaluate the Impact of the Pandemic on Healthcare Systems and Society

- **Core indicators (by age/sex-reported daily/weekly and cumulatively)**
  - # new confirmed cases hospitalized (general and ICU, if available)
  - # confirmed cases discharged or recovered
  - % hospital or ICU beds occupied
  - % hospitalized confirmed COVID-19 cases out of all hospitalizations
  - # confirmed cases among HCW
  - # confirmed case deaths among HCW
  - Estimate of excess mortality
Indicators to Understand the Co-circulation of COVID-19 Virus, Influenza and Other Respiratory Viruses

- Trends over time (by age, sex, region)
  - % positive specimens for SARS-CoV-2 vs. other respiratory viruses
## Objectives of Systems

<table>
<thead>
<tr>
<th>System</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>National surveillance (aggregate or case-based)</td>
<td>Identify all cases of disease at all levels of health system for any nationally notifiable disease to characterize trends and risk factors associated with disease.</td>
</tr>
<tr>
<td>Sentinel surveillance</td>
<td>Identify all cases of disease in a specific site with strong laboratory confirmation to characterize trends and risk factors associated with disease.</td>
</tr>
<tr>
<td>Mortality surveillance</td>
<td>Identify deaths attributable to disease and estimate case fatality proportion and risk factors associated with mortality.</td>
</tr>
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</table>
## Indicators to Characterize Outbreak by Surveillance System

<table>
<thead>
<tr>
<th>Core indicators (by age/sex – reported daily/weekly and cumulatively)</th>
<th>Universal surveillance</th>
<th>Sentinel surveillance</th>
<th>Mortality surveillance</th>
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<tbody>
<tr>
<td># new confirmed cases</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td># deaths in confirmed cases (case-fatality rate)</td>
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<td>*</td>
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<td># persons tested for COVID-19</td>
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*Mortality information is difficult to access from universal surveillance systems unless the event occurs at the time of reporting and often is not updated after reporting unless system is structured to specifically obtain this information.*

**Key**
- Aggregate and case-based reporting
- Case based reporting only
- Population based
Indicators to Monitor Longer Term Epidemiologic Trends and Evolution of COVID-19

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<th>Core indicators (by age/sex – reported daily/weekly and cumulatively)</th>
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<td>Incidence rates (general and by subnational levels)</td>
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</tr>
<tr>
<td>% SARS-CoV-2 cases out of SARI (hospitalized)</td>
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<tr>
<td>% SARS-CoV-2 cases out of ILI cases (outpatient)</td>
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Key

- **Aggregate and case-based reporting**
- **Population based**
# Indicators to Monitor Longer Term Epidemiologic Trends and Evolution of COVID-19

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<td># confirmed COVID-19 deaths among hospitalized cases (hCFR (%))</td>
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## Indicators to Monitor Longer Term Epidemiologic Trends and Evolution of COVID-19

<table>
<thead>
<tr>
<th>Overall and weekly (by age, sex)</th>
<th>National surveillance</th>
<th>Sentinel surveillance</th>
<th>Mortality surveillance</th>
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<tbody>
<tr>
<td>% confirmed cases with risk factors (by underlying conditions or co-morbidity)</td>
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<td></td>
<td></td>
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<tr>
<td>% confirmed deaths with risk factors (by underlying conditions or co-morbidity)</td>
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**Key**
- Case based reporting only
- Population based
Indicators to Evaluate the Impact of the Pandemic on Healthcare Systems and Society

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<td># new confirmed cases hospitalized (general and ICU, if available)</td>
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<td># confirmed cases discharged or recovered</td>
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<td></td>
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*Mortality information is difficult to access from universal surveillance systems unless the event occurs at the time of reporting and often is not updated after reporting unless system is structured to specifically obtain this information.

**Key**

- Orange: Aggregate only
- Light Orange: Aggregate and case-based reporting
- Dark Orange: Case based reporting only
- Dark Brown: Population based
## Indicators to Understand the Co-circulation of COVID-19 Virus, Influenza, and Other Respiratory Viruses

<table>
<thead>
<tr>
<th>Core indicators (by age/sex – reported daily/weekly and cumulatively)</th>
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<th>Sentinel surveillance</th>
<th>Mortality surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>% positive specimens for SARS-CoV-2 vs. other respiratory viruses</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key**

- Light blue: Case based reporting only
- Stripes: Population based
# Strengths

<table>
<thead>
<tr>
<th>National surveillance</th>
<th>Sentinel surveillance</th>
<th>Mortality surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can provide estimates on burden of disease across regions and nationally</td>
<td>Trained personnel to implement syndromic surveillance</td>
<td>Can monitor outcome, disparities in disease across geographic and demographic groups</td>
</tr>
<tr>
<td>Can generate incidence rates for easy interpretation of data</td>
<td>Detailed case information (mild-severe disease)</td>
<td>Requires limited resources</td>
</tr>
</tbody>
</table>
## Limitations

<table>
<thead>
<tr>
<th>National surveillance</th>
<th>Sentinel surveillance</th>
<th>Mortality surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of trends dependent on completeness of variables collected and reliability of lab results</td>
<td>May not be population-based or geographically representative</td>
<td>Weekly counts are rarely published from low-middle-income countries</td>
</tr>
<tr>
<td>Need extensive clinical and lab capacity and resources for robust data management</td>
<td></td>
<td>May require indirect demographic methods for baseline measures or advanced estimation methods for population structure</td>
</tr>
</tbody>
</table>
Considerations for Incorporating COVID-19 Surveillance

Adapt and strengthen existing surveillance systems
At different levels of health care system

Digital technologies
Rapid reporting for data management where possible

Mandatory reporting

Immediate reporting where feasible

Laboratory capacity
SARS-CoV-2-positive and total tests conducted

Representativeness
Geographically, age, risk factors of broader population
Survey of Country Offices

9 responses
- Africa Region (n=7)
- Latin America (n=1)
- Asia (n=1)

<table>
<thead>
<tr>
<th>System</th>
<th>Q2 What surveillance systems are you considering COVID-19?</th>
<th>Q3 What system do you want guidance for?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute febrile illness</td>
<td>44%</td>
<td>33%</td>
</tr>
<tr>
<td>Mortality surveillance</td>
<td>33%</td>
<td>56%</td>
</tr>
<tr>
<td>Case-based surveillance</td>
<td>56%</td>
<td>33%</td>
</tr>
<tr>
<td>ILI surveillance</td>
<td>67%</td>
<td>56%</td>
</tr>
<tr>
<td>SARI surveillance</td>
<td>78%</td>
<td>56%</td>
</tr>
<tr>
<td>Aggregate surveillance</td>
<td>33%</td>
<td>22%</td>
</tr>
<tr>
<td>Community event-based surveillance</td>
<td>56%</td>
<td>56%</td>
</tr>
<tr>
<td>Malaria surveillance</td>
<td>33%</td>
<td>22%</td>
</tr>
<tr>
<td>Polio surveillance</td>
<td>22%</td>
<td>33%</td>
</tr>
</tbody>
</table>
Upcoming Webinars

- Please join us next week, same place, same time for a session on electronic tools to support surveillance.

- Following webinars to come, including mortality surveillance, syndromic surveillance, serosurveys, and more!
WHO Resources for COVID-19 Surveillance

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.