CONCEPT NOTE

GLOBAL REPOSITORY OF EPIDEMIOLOGICAL PARAMETERS

1. Background and context

Throughout the course of an infectious disease outbreak, estimates of epidemiological parameters are required to inform and guide public health interventions designed to mitigate the spread of disease and reduce its impact on affected populations.

These parameters can be used by mathematical models that are critical to understand the transmission dynamics pathogens and to determine the potential impact of outbreaks in terms of morbidity, mortality, and geographical spread over time. Available information on parameters can also be summarized to directly inform specific public health interventions such as contact tracing. For example, the incubation period distribution of the pathogen informs the duration of time required for the follow-up of the contacts of cases to detect potential secondary cases.

In recent years, an unprecedented number of mathematical models have been used as a decision support tool for policy makers in face of uncertainties regarding the future trajectory of emerging and re-emerging diseases such as COVID-19 and mpox. This information is valuable for public health organizations that need to quickly evaluate early trajectories of new outbreaks and estimate their potential public health impact.

2. Problem statement

The lack or limited centralised availability and/or accessibility of information on epidemiological parameters, especially for emerging and re-emerging diseases, can hinder the rapid development of informed public health interventions and more advanced predictive models which are needed to guide decision making. However, as parameters can change overtime based geographical, seasonal, demographical or microbiological context, the identification of reliable parameter estimates often requires ongoing literature review as new information arises.

There is currently no central dynamic repository of epidemiological parameters that the global modelling community can access, use, and contribute to. It's becoming increasingly important to develop such a repository and ensure that it is available as a global public good, to facilitate decision making and enable effective response to public health risks.

3. Future State

The Collaboratory is one of the prime-mover initiatives of the WHO Hub for pandemic and epidemic intelligence. It aims to provide an interactive digital environment where multi-disciplinary public health intelligence communities can interact together to pool resources, share knowledge, and co-create solutions for better decision making.

One of the initial use cases of the Collaboratory is to catalyse the creation of a global repository of epidemiological parameters which will be publicly accessible by modellers, epidemiologist, subject matter experts and decision makers to inform public health response.

While WHO will act as a catalyser, trust anchor, advocate and coordinator for this initiative, the repository will be developed, led, and maintained by the community.

4. Approach

WHO will convene and coordinate a group of experts which will be tasked with the development and implementation of a joint work plan to create an initial pilot of a central repository based on 2-3 prioritized diseases.

The goals of this pilot will be to:

- Develop a standardized and robust protocol for parameters extraction, storage, use and maintenance
- Identify fit-for-purpose tools and governance mechanisms to support the above
- Test initial use cases to identify bottlenecks and mitigation measures

5. Target Audience and their needs

To ensure the long-term success and sustainability of the global repository of epidemiological parameters, it is crucial to ensure that it will address the needs of modelers, subject matter experts, epidemiologists, and policy makers at both local and global levels.

6. Workstreams

The project will focus on five main workstreams, which will constitute the basis of a joint work plan:

i. Workstream 1: Prioritization of diseases and parameters

- Identify priority diseases for the pilot phase (e.g.: diseases with lower number of publications to screen, vaccine preventable diseases that are not part of the Expanded Programme for Immunization (EPI), diseases occurring in humanitarian settings, neglected diseases etc.)

- Identify priority parameters which should be collected to inform decision making (including disease transmission parameters and proxy parameters)
- Identify required contextual information for each parameter (time, season, population demography, etc.)

ii. Workstream 2: Extraction of parameters (including supportive tools)

- Decide on a standardized approach to conduct the search strategy (databases to be used, search syntax, exclusion vs. Inclusion criteria, etc.)
- Decide on methodology (systematic review vs. Rapid review, methodology during peace time vs. Emergency time etc.)
- Decide on criteria to include systematic reviews from other groups (and identify these other groups)
- Explore the use of artificial intelligence to automate some of the extraction processes (e.g.: the screening of articles)
- Explore how and when to leverage grey literature
- Discuss copyright considerations around the extraction of parameter from non-open access articles
- Explore considerations and opportunities for extraction of parameters from primary data (e.g.: explore federated analytics use cases, data storage and access requirements, data linkage needs, etc.)

iii. Workstream 3: Storage and use of parameters

- Identify tools to support parameters extraction and storage (Excel, Access database, Web applications, R packages etc.)
- Develop methods to synthesize the information collected
- Explore tools that support the storage of parameters in formats usable in analytical pipelines (e.g., epiparameter R package)

iv. Workstream 4: Maintenance and validation of parameters

- Identify mechanisms for the live update of the parameters database (e.g., crowdsourcing, authors contributions, etc.)
- Discuss challenges and mitigation measures for the mechanisms identified above (e.g., bias, conflict of interest, incentives, etc.)
- Identify mechanisms for validation and quality insurance (e.g., checklist of review criteria for assessing modelling papers, visualization of parameters distributions, Amazon-like star system for community ratings, volunteer group of experts to conduct periodic quality insurance, etc.)

v. Workstream 5: Scientific recognition and other incentives

- Identify mechanism for scientific recognition of authors, data donors, community contributions, etc. (e.g., article citations, data/estimate citations via DOIs, acknowledgments, creative commons, etc.)
- Explore other incentives mechanisms

7. Output

The key output from this project will be the following:

- A documented standardized protocol for the extraction of epidemiological characters
- A database of extracted parameters for initial prioritized diseases (additional considerations: visualization of parameters distributions and list of summary estimates)
- A list of tools and packages that can support the extraction and use of parameters (R packages, AI algorithms)
- A digital platform to facilitate interactions, collaborations and information sharing between community members (e.g.: GitHub)
- Documented lessons learned from the pilot phase implementation

8. Modes of engagements

- A technical working group (TWG) coordinated by WHO will initially meet on a bi-weekly basis to develop a joint work plan

- The TWG will discuss and organize the implementation of the work plan (including areas of contribution, suggestions of additional contributors, agreed deliverables, etc.)

- The TWG will 1-2 times per month to provide updates on the progress made in each workstream.

- Hackathons and consultations will be organized to test and discuss prototype use cases (e.g., development of R packages for parameters use)

- User surveys will be shared with the modelling community to gather information on community needs and perspectives (e.g.: on parameters to prioritize, preferred storage and use modalities, sustainability models, etc.)

9. Resources

- Human resources needed
  - Modellers
  - Epidemiologists
  - Subject matter experts
  - Librarians
  - Information specialists
  - Graduate students
  - Technical writers

- Funding considerations
    - Jointly explore internal and external opportunities for funding once the work plan and deliverables have been agreed on.