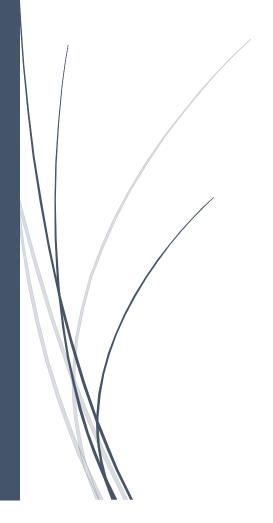# CovidO Ontology Requirements Specification Document

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CovidO Ontology Requirements Specification Document

Goal of development of CovidO

We are developing CovidO, a COVID-19 ontology with the following objectives:

(1) The ontology serves as a reference schema for use in reporting COVID-19 related data.
(2) Ontology cover all the possible viewpoints of COVID-19.
(3) Ontology must cover all the aspects of COVID-19 related information.
(4) Ontology aim to provide a common conceptualization and thereby abstract from heterogeneous structures of existing sources of (static) data and provide a common linking schema, which is essential to utilize FAIR principles.
(5) Offer a customized schema of the existing ontologies in order to build a common global data mod.

Uses/Applications of CovidO

The CovidO ontology is very useful in the various application such as:

- Provide kind of a common vocabulary for multiple systems.
- The CovidO ontology might be use for effective knowledge modelling.
- Provide the semantic annotation for the COVID-19 related information.
- Construction of the semantic interconnected network for COVID-19.
- Integration with another domain, etc.

Data Sources

The novel coronavirus (COVID-19) is a global pandemic declared by World Health Organization (WHO) [1] as outbreak a Public Health Emergency of International Concern on 30 January 2020. Since 11 March 2020, various data sources like

- WHO (https://covid19.who.int),
- DXY.CN(https://dxy.cn),
- BNO News (https://bnonews.com),
- China CDC (CCDC) (https://chinacdc.cn/en/),
- National Health Commission (NHC)(http://en.nhc.gov.cn),
- Hong Kong Health Department (https://www.dh.gov.hk),
- Macau Government (https://www.gov.mo/en/),

- Government of India (https://www.mygov.in/covid-19),
- Indian Statistical Institute Bangalore (https://www.isibang.ac.in/~athreya/incovid19/),
- Maryland department of health (https://coronavirus.maryland.gov/) etc.

Available Ontologies:

Several ontologies represent the COVID-19 pandemic in different contexts. We have found 13 ontologies related to COVID -19 which represent different scope of COVID -19. Some relevant to COVID-19 ontology is explained as follows:

Ontology ID	Ontology	Abbreviation
O1	Infectious Disease Ontology	IDO
O2	Virus Infectious Disease Ontology	VIDO
O3	Coronavirus Infectious Disease Ontology	CIDO
O4	CIDO-COVID-19	CIDO-COVID-19
O5	COVID-19 Ontology	COVID-19 Ontology
O6	Covid-19 Infectious Disease Ontology	IDO-COVID-19
O7	COviD-19 Ontology for the case and patient information	CODO
O8	COVID-19 surveillance Ontology	COVID-19 surveillance
O9	The Covid19 Impact on Banking Ontology	Covid19-IBO
O10	Knowledge Graph for COVID-19	Kg-COVID-19
O11	Drug for COVID-19	DRUGS4COVID19
O12	COVIDCRFRAPID	COVIDCRFRAPID
O13	Country Responses towards COVID-19	ROC

Ontology Requirement

To define the scope for CovidO recommendation to formalize requirements through user stories, competency questions (CQ:s), contextual statements, and reasoning requirements have helped structure and delimit the modelling problems. Some examples of CQ:s that the CovidO ontology to be built should be able to answer. The complete set of CQ is provided in the GitHub link \url{https://cutt.ly/iLJPV2O}. Based on the assumption that each CQ contains valuable information about the domain of the ontology, we extract relevant concepts and relations provided at given link. Top most ask questions are given below.

Scope of CovidO as CQ

1. Which country reported the first Covid - 19 case?
2. Which country reported the first Covid - 19 death?
3. Which country reported the first Covid - 19 recovered?
4. On which date was the first Covid-19 case reported?
5. On which date was the first Covid-19 death reported?
6. On which date was the first Covid-19 recovered case reported?
7. How many new cases were found at any place p on date t?
8. How many new deaths were found at any place p on date t?
9. How many new recover cases were found at any place p on date t?
10. Find the total number of confirmed cases on date t?
11. Find the total number of deaths on date t?
12. Find the total number of recovered cases on date t?
13. Find Continent-wise maximum number of Covid-19 cases?
14. Find Country-wise maximum number of Covid-19 cases?
15. Find State-wise maximum number of Covid-19 cases of Country C?
16. Find City-wise maximum number of Covid-19 cases of State S?
17. Which Continent reported the highest Covid 19 recover cases until now?
18. Which Country reported the highest Covid 19 recover cases until now?
19. Which State reported the highest Covid 19 recover cases until now?
20. Which City of State's reported the highest Covid 19 recover cases until now?
21. Find the number of deceased due to Covid 19 in the year 2020?
22. Find the number of deceased due to Covid 19 in the month September, 2020?
23. What was the peak one-day surge in new cases in India?
24. What is the information of patient stored?
25. What are the symptoms of a Covid patient?
26. What could be the possible status of the Covid patients?
27. How many patients declared Covid positive?
28. What is the travel history of a patient p?
29. What is count of patient travelled from China?
30. List the Covid patients have died on date t?
31. Find all patients have Covid-19 test results positive with closed connection Covid patients?

32. Find all people diagnosed with Covid [who are in family relations Covid positive]
33. Gives all the patients who have contracted the virus from another.
34. List all the Covid patients age between 18 and 30.
35. List the person whose profession is a doctor?
36. What are the diagnoses test available for Covid?
37. What test should I get to see if I have COVID-19?
38. Determine the type of virus?
39. Find the different variant of Covid?
40. What is the critical oxygen saturation of a human body for Covid?
41. What is the measurement of high blood pressure?
42. What is the measurement of low blood pressure?
43. What are the drugs prescribe by doctors for Covid?
44. How many people have been vaccinated with the Covaxin vaccine?
45. How many people have been vaccinated with the SputnikLitevaccine?
46. How many people have been vaccinated with the SputnikV vaccine?
47. How many people have critical oxygen saturation?
48. How many people need oxygen ventilator?
49. How many patients affected by other disease?
50. What is the time duration of vaccine to protect from Covid?

Ontology Development/Editing Tool:

We have used Protégé-2000 as an ontology-developing environment for our examples (CovidO). We have tried to address the very basics of ontology development and have not discussed many of the advanced topics or alternative methodologies for ontology development.