

DBMS Lab 1: Database Design: COVID-19 Tracking Information System (20CS30062 - Swarup Padhi)

QUESTION

Design the E-R diagram to capture the logical data organization for the COVID-19 tracking system described below. Convert the E-R diagram to relational tables.

Upload a pdf file with the E-R diagram and the table definitions to moodle. Credits will be given based on the richness of the design and the number of functionalities that may be supported.

System Description:

A large-scale pandemic creates confusion and leads to the spread of rumours. We would like to build an information system where a user can access verified information about the pandemic. We obtain data from the following sources:

1. Hospitalizations: including patient information including location, symptoms, treatments involved, and healthcare resources used.
2. Self-reporting from affected citizens
3. Testing labs

4. Vaccination centres

5. Social media

The system is supposed to cater to the information need of the following users.

1. Citizens: for information gathering about various facets of the pandemic
2. Healthcare professionals: for patient profile, disease and symptom tracking
3. Government agencies: for resource mobilization and infrastructure readiness

Various features of the system include – i. reporting the prevalence and progress of the pandemic with time, among various patient profiles, geographical units like districts and states, ii. tracking symptoms and variants that are currently common, iii. use of healthcare resources and inventory management for future readiness, iv. contact tracing, v. any other functionality that you want to support.

Description_of_ER_DIAGRAM (ER Diagram attached at last)

Entities:

1. Strong

- a. Social_media - Separate entity without any relations as no platform gives data with the identity of users.
- b. Citizen - To represent all details of a citizen
- c. Vaccination_centre - To represent all details of a vax. centre

- d. Testing_Lab - To represent all details of a testing lab
- e. Hospital - To represent all details of a hospital
- f. State_govt_covid_agency - Information about the state government.

2. Weak

- a. self_report_details
- b. hospitalisation_details
- c. Vaccination_centre_info
- d. hospital_resources

Relations:

1. Identifying

- a. self_report
- b. vax_centre_details
- c. hospital_details
- d. Treatment

2. Others

- a. vaxed
- b. vaccine_supply
- c. testing_kit_supply
- d. hospitalisation_tests
- e. treating_hospital
- f. covid_tests

Due to the application constraints, I could not underline discriminators of weak entities of the E-R diagram with a dashed line. Therefore, I have enclosed them with <> in the diagram.

RELATIONAL SCHEMAS

Underlined attributes are part of the **primary key set**.

Assumptions:

- In some places, the attribute name has been given differently as in the E-R diagram so as to make it easy to understand the meaning.
- The composite attribute 'address' has not been expanded and rather written as a single-valued attribute in the relational schema to make the diagram clearer to understand. In actuality, that will be expanded to the attributes as given in the E-R diagram
- Identifying relationship sets is not a part of the relationship schema as the task of it is already being fulfilled while creating the table for the weak entity.
- The date attribute is assumed to be in dd-mm-yyyy format.
- Time attribute assumed to be in 24-hour format
- The identifying set of the relationships is considered to be a combination of the primary key of the entities it is relating to and its own discriminators. (similar in logic to weak entity sets)

Entities:

- citizen(aadhar_no,first_name,middle_name,last_name,date_of_birth,sex,street_no,city,district,state,pincode)
- phone(aadhar_no,phone_number)

- self_report_details(aadhar_no,date,isolation_days)
- self_report_symptoms(aadhar_no,date,symptom_name)
- self_report_treatments(aadhar_no,date,medicine)
- self_report_locations(aadhar_no,date,city)
- Vaccination_centre(centre_id,street_no,city,district,state,pincode,type(walk-in/pre-regist.))
- Vaccination_centre_info(centre_id,date,no_of_available_vaccines,no_of_people_vaccinated,no_of_nurses,opening_time,closing_time,days_operational)
- Hospitalization_details(aadhar_no,start_date,end_date,outcome(cured/not-cured/dead),variant_affected_with)
- Hospitalization_treatment_details(aadhar_no,start_date,end_date,medicine)
- Hospitalization_symptoms(aadhar_no,start_date,end_date,symptom_name)
- Hospital(name,address)
- Hospital_departments(name,address,dept_name)
- hospital_resources(name,address,no_of_doctors,no_of_beds,no_of_oxygen_cylinders,no_of_covid_kits)
- Testing_Lab(street_no,city,district,state,pincode,no_of_workers,capacity,opening_time,closing_time,days_operational)
- Social_media(post_id,platform,date,content)
- Social_media_tags(post_id,platform,tags)
- State_govt_covid_agency(State,no_of_covid_kits,no_of_vaccines,no_of_testing_kits)

Relations:

- vaxed(aadhar_no,centre_ID,date,type(covishield/covaxin))
- covid_test(aadhar_no,address_of_lab,date,type(RAT/RT-PCR))

- hospitalization_tests(aadhar_no,start_date,end_date,date,type(RAT/RT-PCR))
- treating_hospital(aadhar_no,start_date,end_date,hospital_name,hospital_address)
- Testing_kit_supply(state_of_govt,address_of_lab,date,no_of_kits_supplied)
- Vaccine_supply(state_of_govt,address_of_lab,date,no_of_vaccines_supplied)

Functionalities provided

1. Reporting the prevalence and progress of the pandemic with time, among various patient profiles, geographical units like districts and states

-> Sample queries such as finding the 'number of people affected in a particular region on a particular date can be done by first checking if each citizen is part of a region and then checking whether he had a positive covid test on that date. Furthermore, since the address includes districts and states, all types of geographical units can be used in the query. Also, the number of deaths on a date can be found by querying the hospitalizations with that end date and finding if the person died or not.

2. Tracking symptoms and variants that are currently common

-> Can be found by taking a specific window of time and finding out any hospitalisations during that window along with the affected variant and symptoms

3. Use of healthcare resources and inventory management for future readiness

-> Can be found by the number of resources a particular government has and has supplied on a given data.

4. Contact tracing

-> Can be traced by the locations provided by the self-reporting of an individual over some days.

5. Other functionalities supported

-> Finding the number of positive tests on a day

Finding the number of vaccines administered on a day

Finding the medicines that are able to cure more often

Finding the availability of resources at any medical centre and thereby allocating resources if needed.

Finding the number of workers currently working in a lab or a hospital.

