



## **IT - 214 DBMS PROJECT**

### **Global Health Analytics**

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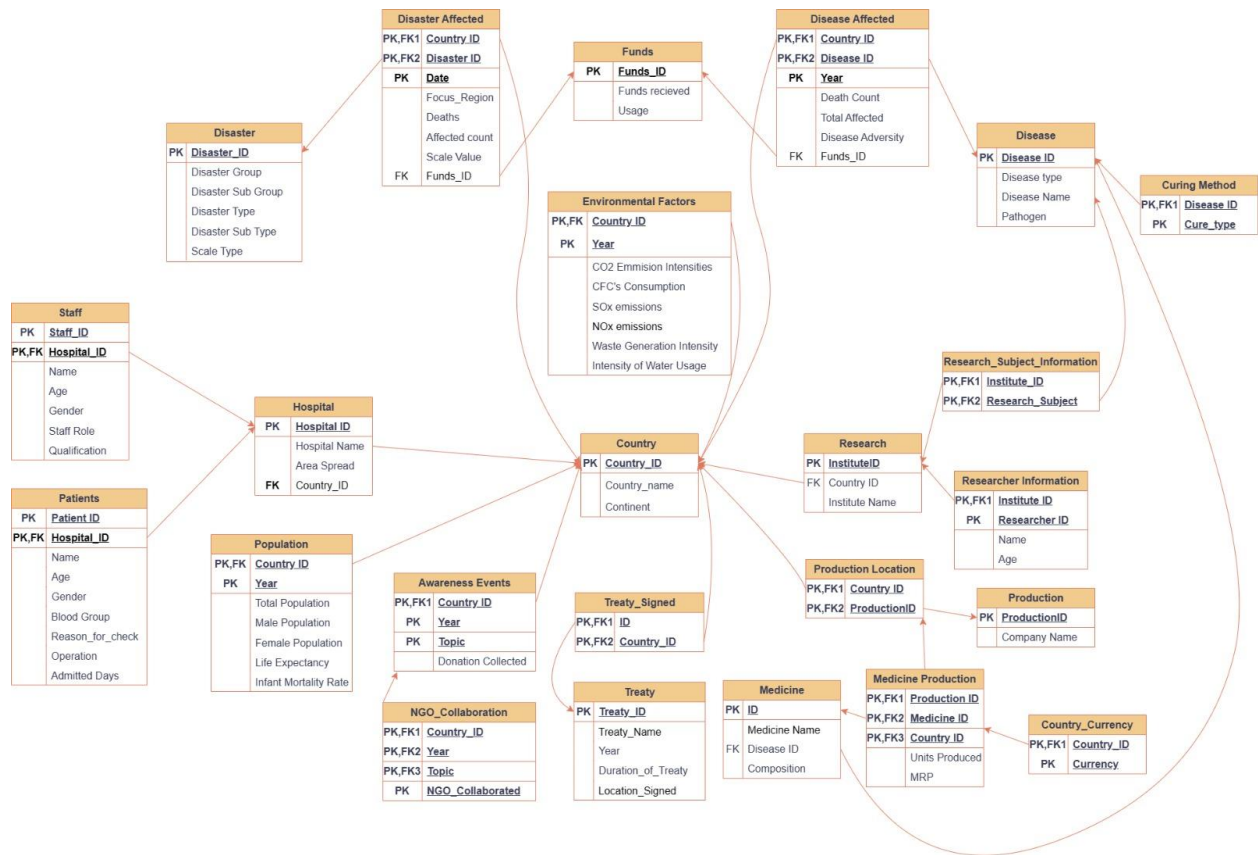
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The diagram is a detailed Entity-Relationship (ER) model for a 'Global Health Analytics' system. It features a central 'Country' entity that acts as a hub, connected to many other entities. Key entities include:

- Disease**: Attributes include disease\_id, disease\_name, pathogen, and disease\_type. It is linked to 'Disease Occurrence' and 'Affected Diseases'.
- Patient**: Attributes include patient\_id, patient\_name, age, sex, and location. It is linked to 'Disease Occurrence', 'Research', and 'Medical History'.
- Research**: Attributes include research\_id, research\_title, researcher, and funding\_source. It is linked to 'Patient' and 'Affected Diseases'.
- Population**: Attributes include population\_id, population\_name, male\_population, female\_population, and life\_expectancy. It is linked to 'Country' and 'Research'.
- Medical History**: Attributes include medical\_id, patient\_id, diagnosis, and treatment. It is linked to 'Patient'.
- Affected Diseases**: Attributes include affected\_disease\_id, patient\_id, and disease\_id. It is linked to 'Patient' and 'Disease'.
- Researcher**: Attributes include researcher\_id, researcher\_name, and research\_title. It is linked to 'Research'.
- Medical History**: Attributes include medical\_id, patient\_id, diagnosis, and treatment. It is linked to 'Patient'.
- Researcher**: Attributes include researcher\_id, researcher\_name, and research\_title. It is linked to 'Research'.
- Medical History**: Attributes include medical\_id, patient\_id, diagnosis, and treatment. It is linked to 'Patient'.
- Researcher**: Attributes include researcher\_id, researcher\_name, and research\_title. It is linked to 'Research'.

The diagram uses standard ER notation: rectangles for entities, ovals for attributes, and diamonds for relationships. Lines connect entities to their attributes and to their relationships. Cardinalities (1, N) and primary/foreign key indicators (solid vs. dashed lines) are used to define the data model's structure.

## Relational Schema :



## Normalization Proofs :

### Minimal FD Set :

#### 1. Country:

ID → Country\_name, Continent

#### 2. Disaster:

Disaster ID → Disaster\_group, Disaster\_sub\_group, Disaster\_Type, Disaster\_sub\_type, Scale\_Type

#### 3. Disease:

Disease ID → Disease\_name, Disease\_type, Pathogen

#### 4. Population:

(Country\_ID, Year) → Total\_Population, Male Population, Female Population, Life Expectancy, Infant Mortality Rate

#### 5. Environmental Factors:

(Country\_ID, Year) → Co2\_emission\_intensities, CFC's consumption, SOx and NOx emissions, Waste\_Generation\_intensity, Intensity\_of\_Water\_Usage

#### 6. Hospital:

(Hospital\_ID) → Country\_ID, Hospital\_Name, Area, Rating

## **7. Patients:**

(Patient\_ID, Hospital\_ID) → Name, Age, Sex, Blood\_group, Operation, Admitted\_Days, Staff\_ID

## **8. Staff:**

(Staff\_Id, Hospital\_ID) → Name, Age, Sex, Staff\_role, Qualifications

## **9. Awareness\_Events:**

(Country\_ID, Year, Topic) → Donation

## **10. NGO\_Collaborated:**

No non-trivial functional dependency exists.

## **11. Treaty:**

Treaty\_ID → Treaty\_Name, Year, Duration\_of\_Treaty, Location\_signed

## **12. Treaty\_between:**

No non-trivial functional dependency exists.

## **13. Research:**

Institute\_ID → Institute Name

## **14. Research Information:**

(Institute\_ID, Researcher\_ID) → Name, Age

### **15. Production:**

Production\_ID → Company\_name

### **16. Production\_Location:**

No non-trivial functional dependency exists.

### **17. Medicine:**

(ID) → Composition, Medicine\_Name

### **18. Medicine\_Production:**

(Production\_ID, Medicine\_ID, Country\_ID) → MRP

Country\_ID → Currency

### **19. Funds:**

Funds\_ID → Usage, Funds\_received

### **20. Disease\_Affected:**

(Country\_ID, Disease\_ID, Year) → Death\_Count, Total\_Affected, Disease\_Adversity,  
Funds\_ID

### **21. Disaster\_Affected:**

(Country\_ID, Disaster\_ID, Date) → Deaths, Affected\_count,  
Scale\_value, Focus\_Region, Funds\_ID

## **22. Curing Method:**

No non-trivial functional dependency exists.

## **23. Research\_Subject\_Information:**

No non-trivial functional dependency exists.

## **24. Country\_Currency:**

No non-trivial functional dependency exists.

## **Proof that relations are in BCNF :**

### **1. Country :**

$\{ID\}^+ = (ID, Country\_name, Continent)$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **2. Disaster :**

$\{Disaster\_ID\}^+ = (Disaster\_ID, Disaster\_Group, Disaster\_Sub-Group,$   
 $Disaster\_Type, Disaster\_Sub-Type, Scale\_Type)$

As ID determines all the attributes of the relation and all the attributes

depend only on the candidate key, hence this relation is in BCNF.

### **3. Disease :**

$\{\text{Disease\_ID}\}^+ = (\text{Disease\_ID}, \text{Disease\_Name}, \text{Disease\_Type}, \text{Pathogen})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **4. Population :**

$\{\text{Country\_ID}, \text{Year}\}^+ = (\text{Country\_ID}, \text{Year}, \text{Total\_population}, \text{Male\_population}, \text{Female\_population}, \text{Life\_expectancy}, \text{Infant\_mortality\_rate})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **5. Environmental Factors:**

$\{\text{Country\_ID}, \text{Year}\}^+ = (\text{Country\_ID}, \text{Year}, \text{Co2\_emission\_intensities}, \text{CFC's consumption}, \text{SOx and NOx emissions}, \text{Waste\_Generation\_intensity}, \text{Intensity\_of\_Water\_Usage})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **6. Hospital:**

$\{\text{Hospital\_ID}\}^+ = (\text{Country\_ID}, \text{Hospital\_ID}, \text{Hospital\_name}, \text{Area})$



As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **7. Staff:**

$\{\text{Staff\_Id}, \text{Hospital\_Id}\}^+ = (\text{Staff\_Id}, \text{Hospital\_Id}, \text{Name}, \text{age}, \text{gender}, \text{staff role}, \text{Qualification})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **8. Patients:**

$\{\text{Patient\_ID}, \text{Hospital\_ID}\}^+ = (\text{Patient\_ID}, \text{Hospital\_ID}, \text{Name}, \text{Age}, \text{Gender}, \text{Blood\_group}, \text{Reason\_check}, \text{Operation}, \text{Admitted\_Days})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **9. Awareness\_Events:**

$\{\text{Country\_ID}, \text{Year}, \text{Topic}\}^+ = (\text{Country\_ID}, \text{Year}, \text{Topic}, \text{Donation})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **10. NGO\_Collaborated:**

$\{\text{Country\_ID}, \text{Year}, \text{Topic}, \text{NGO\_collaborated}\}^+ = (\text{Country\_ID},$

Year,Topic, NGO\_collaborated)

Here, since all the attributes combined is the key, hence this is also in BCNF.

### **11.Treaty:**

$\{\text{Treaty\_ID}\}^+ = (\text{Treaty\_ID}, \text{Treaty\_Name}, \text{Year}, \text{Duration\_of\_Treaty}, \text{Location\_signed})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **12.Treaty\_Between:**

$\{\text{Country\_ID}, \text{ID}\}^+ = (\text{Country\_ID}, \text{ID}, \text{Year}, \text{Duration\_of\_Treaty}, \text{Location\_signed})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **13. Research:**

$\{\text{Country\_ID}, \text{Institute\_ID}\}^+ = (\text{Country\_ID}, \text{Institute\_ID}, \text{Institute\_Name})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

#### **14.Research Information:**

$\{\underline{Institute\_ID}, \underline{Researcher\_ID}\}^+ = (Institute\_ID, Researcher\_ID, Name, Age)$

Here, since all the attributes combined is the key. Hence this is also in BCNF.

#### **15.Production:**

$\{Production\_ID\}^+ = (Production\_ID, Company\_name)$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

#### **16.Medicine:**

$\{ID\}^+ = (ID, Composition, Medicine\_Name)$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

#### **17.Medicine Production:**

$\{Production\_ID, Medicine\_ID, Country\_ID\}^+ = (Production\_ID, Medicine\_ID, Country\_ID, MRP)$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **18.Funds:**

$\{\text{Funds\_ID}\}^+ = (\text{Funds\_ID}, \text{Usage}, \text{Funds\_received})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **19.Production\_Location:**

$\{\text{Production\_ID}, \text{Country\_ID}\}^+ = (\text{Production\_ID}, \text{Country\_ID})$

Here, since all the attributes combined is the key. Hence this is also in BCNF.

### **20. Disaster\_Affected:**

$\{\text{Country\_ID}, \text{Disaster\_ID}, \text{Date}\}^+ = (\text{Country\_ID}, \text{Disaster\_ID}, \text{Date}, \text{Deaths}, \text{Affected\_count}, \text{Scale\_value}, \text{Focus\_Region}, \text{Funds\_ID})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

### **21. Disease\_Affected:**

$\{\text{Country\_ID}, \text{Disaster\_ID}, \text{Year}\}^+ = (\text{Country\_ID}, \text{Disaster\_ID}, \text{Year}, \text{Deaths\_Count}, \text{Total\_Affected}, \text{Disease\_Adversity})$

As ID determines all the attributes of the relation and all the attributes depend only on the candidate key, hence this relation is in BCNF.

## **22. Curing Method:**

$\{\text{Disease\_ID, cure\_type}\}^+ = (\text{Disease\_ID, cure\_type})$

Here, since all the attributes combined is the key, hence this is also in BCNF.

## **23. Country\_Currency:**

$\{\text{Country\_ID, Currency}\}^+ = (\text{Country\_ID, Currency})$

Here, since all the attributes combined is the key. Hence this is also in BCNF.

## **24. Research\_Subject\_Information:**

$\{\text{Institute\_ID, Research\_subject}\}^+ = (\text{Institute\_ID, Research\_subject})$

Here, since all the attributes combined is the key, hence this is also in BCNF.