**Project:** Synthetic Clinical Patient Database

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**Overall instructions**

**This submission MUST be a ZIP including:**

* **This document with queries and screenshots**
* **A DML script with the full sequence of SQL statements used to populate all the Z\_ tables in 3.c**

**1. INGEST DATA**

Ingest data (from CSV files) in the following tables:

* T\_PATIENT\_IMMUNIZATION
* T\_PATIENT\_IMAGING\_STUDY

\* **You don’t need to present anything here**, just make sure you have the data loaded.

**2. NORMALIZATION**

Use the data ingested into the two tables above to populate the normalized version of the following tables in the right order:

* Z\_PATIENT\_IMMUNIZATION
* Z\_PATIENT\_IMAGING\_STUDY
* Z\_IMMUNIZATION
* Z\_BODYSITE
* Z\_MODALITY
* Z\_SOP

\* Prepare the DML script (it will be required in section 3), but **you don’t need to present anything here**, just make sure you have all tables with corresponding data correctly ingested.

**3. RECREATE**

\* **Each student MUST execute this section in your own database account.**

\*\* **Notice the space for each student’s screenshot in the list of “check” queries.**

1. ***Drop all the Z\_ tables*** from your database, just keep the T\_ tables with the original data from the CSV files:

DROP TABLE Z\_ALLERGY cascade constraints;

DROP TABLE Z\_BODYSITE cascade constraints;

DROP TABLE Z\_CITY cascade constraints;

DROP TABLE Z\_COUNTRY cascade constraints;

DROP TABLE Z\_COUNTY cascade constraints;

DROP TABLE Z\_ETHNICITY cascade constraints;

DROP TABLE Z\_GENDER cascade constraints;

DROP TABLE Z\_IMMUNIZATION cascade constraints;

DROP TABLE Z\_MARITAL\_STATUS cascade constraints;

DROP TABLE Z\_MODALITY cascade constraints;

DROP TABLE Z\_PATIENT cascade constraints;

DROP TABLE Z\_PATIENT\_ALLERGY cascade constraints;

DROP TABLE Z\_PATIENT\_IMAGING\_STUDY cascade constraints;

DROP TABLE Z\_PATIENT\_IMMUNIZATION cascade constraints;

DROP TABLE Z\_RACE cascade constraints;

DROP TABLE Z\_SOP cascade constraints;

DROP TABLE Z\_STATE cascade constraints;

1. Then, ***recreate all the Z\_ tables*** (empty tables) using the ZTABLES.sql script attached (all tables and foreign keys MUST be created during this step – the script MUST be run in full without errors before moving forward)
2. ***Data ingestion***: prepare and execute the DML script that includes all the step-by-step SQL statements required to populate Z\_ tables – this script MUST be submitted within your ZIP file.
3. Check (queries): each student MUST run the following check queries in you own database account. Minor differences are expected, especially if the content of T\_PATIENT table is not matching 100% the original CSV file. **You don’t need to provide more than 10 records in each screenshot – DO NOT CHANGE THE ORDER BY clause**.

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| Check 1: | **SELECT 1, count(\*) FROM Z\_COUNTRY UNION ALL**  **SELECT 2, count(\*) FROM Z\_STATE UNION ALL**  **SELECT 3, count(\*) FROM Z\_COUNTY UNION ALL**  **SELECT 4, count(\*) FROM Z\_CITY**  **ORDER BY 1;** |
| Allie (as5664) |  |
| Francis (fv48) |  |
| Andrew (ac4267) |  |

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| Check 2: | **SELECT COUNTRY\_ID**  **, STATE\_ID**  **, count(\*)**  **, count(distinct COUNTY\_ID)**  **FROM Z\_CITY**  **GROUP BY COUNTRY\_ID, STATE\_ID**  **ORDER BY 3 desc;** |
| Allie (as5664) |  |
| Francis (fv48) |  |
| Andrew (ac4267) |  |

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| Check 3: | **SELECT 1, 0, count(\*)**  **FROM T\_PATIENT**  **UNION ALL**  **SELECT 2, BIRTH\_PLACE\_COUNTRY\_ID, count(\*)**  **FROM Z\_PATIENT**  **GROUP BY BIRTH\_PLACE\_COUNTRY\_ID**  **ORDER BY 1,3 desc;** |
| Allie (as5664) |  |
| Francis (fv48) |  |
| Andrew (ac4267) |  |

**4. SQL: answer the questions below using T\_ and Z\_ tables only, but separately.**

\* **I recommend each student should test all queries in their own database accounts and compare results. However, only two results (T\_ and Z\_) per question is required here.**

Part 1: **Immunizations**

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| Question 1: | **What is the distribution of race regarding immunization record for Influenza?** |
| T Query (SQL): | SELECT a.RACE, COUNT(b.IMMUNIZATION\_DESCRIPTION)  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE b.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'  GROUP BY a.RACE; |
| T Result: |  |
| Z Query (SQL): | SELECT b.RACE\_DESCRIPTION, COUNT(c.IMMUNIZATION\_CODE)  FROM Z\_PATIENT a  JOIN Z\_RACE b ON a.RACE\_ID = b.RACE\_ID  JOIN Z\_PATIENT\_IMMUNIZATION c ON a.PATIENT\_ID = c.PATIENT\_ID  JOIN Z\_IMMUNIZATION d ON c.IMMUNIZATION\_CODE = d.IMMUNIZATION\_CODE  WHERE d.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'  GROUP BY b.RACE\_DESCRIPTION; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are nearly identical. It looks like we are missing four instances of Asian in the Z\_PATIENT\_IMMUNIZATION table. |

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| Question 2: | **What is the top-3 immunization that covers the age of 18 or below rather than Influenza?** |
| T Query (SQL): | SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*)  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) <=18 AND b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  GROUP BY b.IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC  FETCH FIRST 3 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT c.IMMUNIZATION\_DESCRIPTION, COUNT(\*)  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE  WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) <= 18 AND c.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  GROUP BY c.IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC  FETCH FIRST 3 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 3: | **What is the top 5 immunizations that cover the age range [20-25] rather than Influenza?** |
| T Query (SQL): | SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*)  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) >= 20 AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) <= 25  AND b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  GROUP BY b.IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC  FETCH FIRST 5 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT c.IMMUNIZATION\_DESCRIPTION, COUNT(\*)  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE  WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) >= 20 AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) <= 25  AND c.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  GROUP BY c.IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC  FETCH FIRST 5 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 4: | **Which living county has the most immunization coverage for DTaP?** |
| T Query (SQL): | SELECT a.COUNTY, COUNT(\*)  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE b.IMMUNIZATION\_DESCRIPTION = 'DTaP'  GROUP BY a.COUNTY  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT c.COUNTY\_NAME, COUNT(\*)  FROM Z\_PATIENT a  JOIN Z\_CITY b ON a.LIVING\_PLACE\_CITY\_ID = b.CITY\_ID  JOIN Z\_COUNTY c ON b.COUNTY\_ID = c.COUNTY\_ID  JOIN Z\_PATIENT\_IMMUNIZATION d ON a.PATIENT\_ID = d.PATIENT\_ID  JOIN Z\_IMMUNIZATION e ON d.IMMUNIZATION\_CODE = e.IMMUNIZATION\_CODE  WHERE e.IMMUNIZATION\_DESCRIPTION = 'DTaP'  GROUP BY c.COUNTY\_NAME  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 5: | **Which specific immunization for Hepatitis A or B was most taken by female patients?** |
| T Query (SQL): | SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*)  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE a.GENDER = 'F' AND b.IMMUNIZATION\_DESCRIPTION LIKE 'Hep%'  GROUP BY b.IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT c.IMMUNIZATION\_DESCRIPTION, COUNT(\*)  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE  WHERE a.GENDER\_ID = 'F' AND c.IMMUNIZATION\_DESCRIPTION LIKE 'Hep%'  GROUP BY c.IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 6: | **Number of immunizations have reduced from 2019 to 2020 due to COVID. Which ones are the top-3 immunizations with higher decreasing ratio rather than ‘Influenza’?** |
| T Query (SQL): | SELECT a.IMMUNIZATION\_DESCRIPTION, b.COUNT\_2020, a.COUNT\_2019, ROUND(((b.COUNT\_2020 / a.COUNT\_2019 ) - 1)\*100,2) AS PERCENT\_CHANGE  FROM (SELECT IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2019  FROM T\_PATIENT\_IMMUNIZATION  WHERE IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  AND IMMUNIZATION\_DATE LIKE '%-19'  GROUP BY IMMUNIZATION\_DESCRIPTION) a  JOIN (SELECT IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2020  FROM T\_PATIENT\_IMMUNIZATION  WHERE IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  AND IMMUNIZATION\_DATE LIKE '%-20'  GROUP BY IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION  ORDER BY PERCENT\_CHANGE  FETCH FIRST 3 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT a.IMMUNIZATION\_DESCRIPTION, b.COUNT\_2020, a.COUNT\_2019, ROUND(((b.COUNT\_2020 / a.COUNT\_2019 ) - 1)\*100,2) AS PERCENT\_CHANGE  FROM (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2019  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  WHERE b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  AND a.IMMUNIZATION\_DATE LIKE '%-19'  GROUP BY b.IMMUNIZATION\_DESCRIPTION) a  JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2020  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  WHERE b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'  AND a.IMMUNIZATION\_DATE LIKE '%-20'  GROUP BY b.IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION  ORDER BY PERCENT\_CHANGE  FETCH FIRST 3 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 7: | **When is the peak season (month) that patients got immunization for Influenza in 2019? Was it the same month in 2020?** |
| T Query (SQL): | SELECT substr(IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2019  FROM T\_PATIENT\_IMMUNIZATION  WHERE IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'  AND IMMUNIZATION\_DATE LIKE '%-19'  GROUP BY substr(IMMUNIZATION\_DATE,4,3)  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY;  SELECT substr(IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2020  FROM T\_PATIENT\_IMMUNIZATION  WHERE IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'  AND IMMUNIZATION\_DATE LIKE '%-20'  GROUP BY substr(IMMUNIZATION\_DATE,4,3)  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT substr(a.IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2019  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  WHERE b.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'  AND a.IMMUNIZATION\_DATE LIKE '%-19'  GROUP BY substr(a.IMMUNIZATION\_DATE,4,3)  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY;  SELECT substr(a.IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2020  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  WHERE b.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'  AND a.IMMUNIZATION\_DATE LIKE '%-20'  GROUP BY substr(a.IMMUNIZATION\_DATE,4,3)  ORDER BY COUNT(\*) DESC  FETCH FIRST 1 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are nearly identical. The Z query’s counts are one less than the T query’s counts. The peak season that patients got immunizations for Influenza for 2019 is not the same as 2020, however we do not have a full year’s worth of data for 2020. |

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| Question 8: | **How many patients don’t have any immunization records?** |
| T Query (SQL): | SELECT (a.ALL\_PATIENTS - b.IMMUNIZED\_PATIENTS) AS NOT\_IMMUNIZED  FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS  FROM T\_PATIENT) a,  (SELECT COUNT(UNIQUE(PATIENT\_ID)) AS IMMUNIZED\_PATIENTS  FROM T\_PATIENT\_IMMUNIZATION) b; |
| T Result: |  |
| Z Query (SQL): | SELECT (a.ALL\_PATIENTS - b.IMMUNIZED\_PATIENTS) AS NOT\_IMMUNIZED  FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS  FROM Z\_PATIENT) a,  (SELECT COUNT(UNIQUE(PATIENT\_ID)) AS IMMUNIZED\_PATIENTS  FROM Z\_PATIENT\_IMMUNIZATION) b; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 9: | **How many patients don’t have immunization records per type of immunization?** |
| T Query (SQL): | SELECT b.IMMUNIZATION\_DESCRIPTION, (a.ALL\_PATIENTS - b.IMMUNIZED) AS NOT\_IMMUNIZED  FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS  FROM T\_PATIENT) a,  (SELECT IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(PATIENT\_ID)) AS IMMUNIZED  FROM T\_PATIENT\_IMMUNIZATION  GROUP BY IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(\*) DESC) b  ORDER BY NOT\_IMMUNIZED DESC; |
| T Result: |  |
| Z Query (SQL): | SELECT b.IMMUNIZATION\_DESCRIPTION, (a.ALL\_PATIENTS - b.IMMUNIZED) AS NOT\_IMMUNIZED  FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS  FROM Z\_PATIENT) a,  (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(a.PATIENT\_ID)) AS IMMUNIZED  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  GROUP BY b.IMMUNIZATION\_DESCRIPTION  ORDER BY IMMUNIZED DESC) b  ORDER BY NOT\_IMMUNIZED DESC; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are nearly identical. All Immunization descriptions, other than “Influenza seasonal injectable preservative free” seem to have decreased by 4 in our Z result. |

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| Question 10: | **How many patients don’t have immunization record per type of immunization, considering the min/max age that each immunization is usually given?** |
| T Query (SQL): | SELECT IMMUNIZATION\_DESCRIPTION, MIN\_AGE, MAX\_AGE, IMMUNIZED\_COUNT, ALL\_PATIENTS, (ALL\_PATIENTS - IMMUNIZED\_COUNT) AS NOT\_IMMUNIZED\_COUNT  FROM (SELECT a.IMMUNIZATION\_DESCRIPTION, a.MIN\_AGE, a.MAX\_AGE, a.IMMUNIZED\_COUNT, b.ALL\_PATIENTS  FROM (SELECT b.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  GROUP BY b.IMMUNIZATION\_DESCRIPTION) a  JOIN (SELECT b.MIN\_AGE, b.MAX\_AGE, COUNT(a.PATIENT\_ID) AS ALL\_PATIENTS  FROM T\_PATIENT a,  (SELECT b.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  GROUP BY b.IMMUNIZATION\_DESCRIPTION) b  WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) > MIN\_AGE AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) < MAX\_AGE  GROUP BY b.MIN\_AGE, b.MAX\_AGE) b ON a.MIN\_AGE = b.MIN\_AGE AND a.MAX\_AGE = b.MAX\_AGE); |
| T Result: |  |
| Z Query (SQL): | SELECT a.IMMUNIZATION\_DESCRIPTION, a.MIN\_AGE, a.MAX\_AGE, a.IMMUNIZED\_COUNT, b.ALL\_PATIENTS, (b.ALL\_PATIENTS - a.IMMUNIZED\_COUNT) AS NOT\_IMMUNIZED\_COUNT  FROM (SELECT c.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE  GROUP BY c.IMMUNIZATION\_DESCRIPTION) a  JOIN (SELECT b.MIN\_AGE, b.MAX\_AGE, COUNT(a.PATIENT\_ID) AS ALL\_PATIENTS  FROM Z\_PATIENT a,  (SELECT c.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE  GROUP BY c.IMMUNIZATION\_DESCRIPTION) b  WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) > MIN\_AGE AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) < MAX\_AGE  GROUP BY b.MIN\_AGE, b.MAX\_AGE) b ON a.MIN\_AGE = b.MIN\_AGE AND a.MAX\_AGE = b.MAX\_AGE; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are nearly identical. |

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| Challenge 1 | **For each immunization, show how many patients took more than one dose of it. Result must be presented in 2 columns only: Immunization and number of patients.** |
| T Query (SQL): | SELECT IMMUNIZATION\_DESCRIPTION, COUNT(PATIENT\_ID) AS NUM\_PATIENTS  FROM (SELECT PATIENT\_ID, IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(IMMUNIZATION\_DATE)) AS DOSE\_COUNT  FROM T\_PATIENT\_IMMUNIZATION  GROUP BY PATIENT\_ID, IMMUNIZATION\_DESCRIPTION  ORDER BY PATIENT\_ID, IMMUNIZATION\_DESCRIPTION)  WHERE DOSE\_COUNT > 1  GROUP BY IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(PATIENT\_ID) DESC; |
| T Result: |  |
| Z Query (SQL): | SELECT IMMUNIZATION\_DESCRIPTION, COUNT(PATIENT\_ID) AS NUM\_PATIENTS  FROM (SELECT a.PATIENT\_ID, b.IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(IMMUNIZATION\_DATE)) AS DOSE\_COUNT  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  GROUP BY a.PATIENT\_ID, b.IMMUNIZATION\_DESCRIPTION  ORDER BY a.PATIENT\_ID, b.IMMUNIZATION\_DESCRIPTION)  WHERE DOSE\_COUNT > 1  GROUP BY IMMUNIZATION\_DESCRIPTION  ORDER BY COUNT(PATIENT\_ID) DESC; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

Part 2: **Imaging Studies**

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| Question 1: | **What is the most common type of imaging study (modality) in the period 2001-2010 comparing to 2011-2020?** |
| T Query (SQL): | SELECT a.MODALITY\_DESCRIPTION, a.COUNT\_2001\_2010, b.COUNT\_2011\_2020  FROM (SELECT MODALITY\_DESCRIPTION, COUNT(\*) AS COUNT\_2001\_2010  FROM T\_PATIENT\_IMAGING\_STUDY  WHERE IMAGING\_STUDY\_DATE > '01-JAN-01' AND IMAGING\_STUDY\_DATE < '31-DEC-10'  GROUP BY MODALITY\_DESCRIPTION) a  JOIN (SELECT MODALITY\_DESCRIPTION, COUNT(\*) AS COUNT\_2011\_2020  FROM T\_PATIENT\_IMAGING\_STUDY  WHERE IMAGING\_STUDY\_DATE > '01-JAN-11' AND IMAGING\_STUDY\_DATE < '31-DEC-20'  GROUP BY MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION  ORDER BY a.COUNT\_2001\_2010 DESC  FETCH FIRST 1 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT a.MODALITY\_DESCRIPTION, a.COUNT\_2001\_2010, b.COUNT\_2011\_2020  FROM (SELECT b.MODALITY\_DESCRIPTION, COUNT(a.PATIENT\_ID) AS COUNT\_2001\_2010  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_MODALITY b ON a.MODALITY\_CODE = b.MODALITY\_CODE  WHERE a.IMAGING\_STUDY\_DATE > '01-JAN-01' AND a.IMAGING\_STUDY\_DATE < '31-DEC-10'  GROUP BY b.MODALITY\_DESCRIPTION) a  JOIN (SELECT b.MODALITY\_DESCRIPTION, COUNT(a.PATIENT\_ID) AS COUNT\_2011\_2020  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_MODALITY b ON a.MODALITY\_CODE = b.MODALITY\_CODE  WHERE a.IMAGING\_STUDY\_DATE > '01-JAN-11' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20'  GROUP BY b.MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION  ORDER BY a.COUNT\_2001\_2010 DESC  FETCH FIRST 1 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 2: | **What are the three most common type of imaging study (modality) for each gender in 2015?** |
| T Query (SQL): | SELECT a.MODALITY\_DESCRIPTION, a.MALE\_COUNT, b.FEMALE\_COUNT  FROM (SELECT b.MODALITY\_DESCRIPTION, COUNT(\*) AS MALE\_COUNT  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE a.GENDER = 'M' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'  GROUP BY b.MODALITY\_DESCRIPTION) a  JOIN (SELECT b.MODALITY\_DESCRIPTION, COUNT(\*) AS FEMALE\_COUNT  FROM T\_PATIENT a  JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE a.GENDER = 'F' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'  GROUP BY b.MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION  ORDER BY a.MALE\_COUNT DESC  FETCH FIRST 3 ROWS ONLY; |
| T Result: |  |
| Z Query (SQL): | SELECT a.MODALITY\_DESCRIPTION, a.MALE\_COUNT, b.FEMALE\_COUNT  FROM (SELECT c.MODALITY\_DESCRIPTION, COUNT(b.PATIENT\_ID) AS MALE\_COUNT  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_MODALITY c ON b.MODALITY\_CODE = c.MODALITY\_CODE  WHERE a.GENDER\_ID = 'M' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'  GROUP BY c.MODALITY\_DESCRIPTION) a  JOIN (SELECT c.MODALITY\_DESCRIPTION, COUNT(b.PATIENT\_ID) AS FEMALE\_COUNT  FROM Z\_PATIENT a  JOIN Z\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  JOIN Z\_MODALITY c ON b.MODALITY\_CODE = c.MODALITY\_CODE  WHERE a.GENDER\_ID = 'F' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'  GROUP BY c.MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION  ORDER BY a.MALE\_COUNT DESC  FETCH FIRST 3 ROWS ONLY; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 3: | **In which year was each type of imaging study (modality) introduced in the hospital?** |
| T Query (SQL): | SELECT MODALITY\_DESCRIPTION, substr(MIN(IMAGING\_STUDY\_DATE),8,2) AS START\_YEAR  FROM T\_PATIENT\_IMAGING\_STUDY  GROUP BY MODALITY\_DESCRIPTION; |
| T Result: |  |
| Z Query (SQL): | SELECT b.MODALITY\_DESCRIPTION, substr(MIN(a.IMAGING\_STUDY\_DATE),8,2) AS START\_YEAR  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_MODALITY b ON a.MODALITY\_CODE = b.MODALITY\_CODE  GROUP BY b.MODALITY\_DESCRIPTION; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

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| Question 4: | **Report the number of imaging studies (each modality in one different column) per body site (in rows).** |
| T Query (SQL): | SELECT UNIQUE(a.BODYSITE\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY a  FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS CT\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY  WHERE MODALITY\_CODE = 'CT'  GROUP BY BODYSITE\_DESCRIPTION) b ON a.BODYSITE\_DESCRIPTION = b.BODYSITE\_DESCRIPTION  FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS DX\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY  WHERE MODALITY\_CODE = 'DX'  GROUP BY BODYSITE\_DESCRIPTION) c ON a.BODYSITE\_DESCRIPTION = c.BODYSITE\_DESCRIPTION  FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS US\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY  WHERE MODALITY\_CODE = 'US'  GROUP BY BODYSITE\_DESCRIPTION) d ON a.BODYSITE\_DESCRIPTION = d.BODYSITE\_DESCRIPTION  FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS CR\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY  WHERE MODALITY\_CODE = 'CR'  GROUP BY BODYSITE\_DESCRIPTION) e ON a.BODYSITE\_DESCRIPTION = e.BODYSITE\_DESCRIPTION; |
| T Result: |  |
| Z Query (SQL): | SELECT UNIQUE(a.BODYSITE\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT  FROM Z\_BODYSITE a  FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS CT\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE  WHERE a.MODALITY\_CODE = 'CT'  GROUP BY b.BODYSITE\_DESCRIPTION) b ON a.BODYSITE\_DESCRIPTION = b.BODYSITE\_DESCRIPTION  FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS DX\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE  WHERE a.MODALITY\_CODE = 'DX'  GROUP BY b.BODYSITE\_DESCRIPTION) c ON a.BODYSITE\_DESCRIPTION = c.BODYSITE\_DESCRIPTION  FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS US\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE  WHERE a.MODALITY\_CODE = 'US'  GROUP BY b.BODYSITE\_DESCRIPTION) d ON a.BODYSITE\_DESCRIPTION = d.BODYSITE\_DESCRIPTION  FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS CR\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE  WHERE a.MODALITY\_CODE = 'CR'  GROUP BY b.BODYSITE\_DESCRIPTION) e ON a.BODYSITE\_DESCRIPTION = e.BODYSITE\_DESCRIPTION; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results differ slightly. |

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| Question 5: | **Report the average age (in years) of patients per imaging studies (each modality in one different column) for each 10-year period (in rows).** |
| T Query (SQL): | SELECT a.TIME\_PERIOD, a.CT\_COUNT, b.DX\_COUNT, c.US\_COUNT, d.CR\_COUNT  FROM (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS CT\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'CT'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) a  JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS DX\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'DX'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) b ON a.TIME\_PERIOD = b.TIME\_PERIOD  JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS US\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'US'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) c ON a.TIME\_PERIOD = c.TIME\_PERIOD  JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS CR\_COUNT  FROM T\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'CR'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) d ON a.TIME\_PERIOD = d.TIME\_PERIOD; |
| T Result: |  |
| Z Query (SQL): | SELECT a.TIME\_PERIOD, a.CT\_COUNT, b.DX\_COUNT, c.US\_COUNT, d.CR\_COUNT  FROM (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS CT\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'CT'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) a  JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS DX\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'DX'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) b ON a.TIME\_PERIOD = b.TIME\_PERIOD  JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS US\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'US'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) c ON a.TIME\_PERIOD = c.TIME\_PERIOD  JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END AS TIME\_PERIOD, COUNT(\*) AS CR\_COUNT  FROM Z\_PATIENT\_IMAGING\_STUDY a  WHERE a.MODALITY\_CODE = 'CR'  GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'  WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'  END) d ON a.TIME\_PERIOD = d.TIME\_PERIOD; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

|  |  |
| --- | --- |
| Challenge 2 | **Report the number of patients that have taken each immunization (rows) per imaging studies (each modality in one different column) – duplicate counts can happen in this report.** |
| T Query (SQL): | SELECT UNIQUE(a.IMMUNIZATION\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT  FROM T\_PATIENT\_IMMUNIZATION a  FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS CT\_COUNT  FROM T\_PATIENT\_IMMUNIZATION a  FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE b.MODALITY\_CODE = 'CT'  GROUP BY a.IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION  FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS DX\_COUNT  FROM T\_PATIENT\_IMMUNIZATION a  FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE b.MODALITY\_CODE = 'DX'  GROUP BY a.IMMUNIZATION\_DESCRIPTION) c ON a.IMMUNIZATION\_DESCRIPTION = c.IMMUNIZATION\_DESCRIPTION  FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS US\_COUNT  FROM T\_PATIENT\_IMMUNIZATION a  FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE b.MODALITY\_CODE = 'US'  GROUP BY a.IMMUNIZATION\_DESCRIPTION) d ON a.IMMUNIZATION\_DESCRIPTION = d.IMMUNIZATION\_DESCRIPTION  FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS CR\_COUNT  FROM T\_PATIENT\_IMMUNIZATION a  FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID  WHERE b.MODALITY\_CODE = 'CR'  GROUP BY a.IMMUNIZATION\_DESCRIPTION) e ON a.IMMUNIZATION\_DESCRIPTION = e.IMMUNIZATION\_DESCRIPTION; |
| T Result: |  |
| Z Query (SQL): | SELECT UNIQUE(a.IMMUNIZATION\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT  FROM Z\_IMMUNIZATION a  FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) CT\_COUNT  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID  WHERE c.MODALITY\_CODE = 'CT'  GROUP BY b.IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION  FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) DX\_COUNT  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID  WHERE c.MODALITY\_CODE = 'DX'  GROUP BY b.IMMUNIZATION\_DESCRIPTION) c ON a.IMMUNIZATION\_DESCRIPTION = c.IMMUNIZATION\_DESCRIPTION  FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) US\_COUNT  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID  WHERE c.MODALITY\_CODE = 'US'  GROUP BY b.IMMUNIZATION\_DESCRIPTION) d ON a.IMMUNIZATION\_DESCRIPTION = d.IMMUNIZATION\_DESCRIPTION  FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) CR\_COUNT  FROM Z\_PATIENT\_IMMUNIZATION a  JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE  FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID  WHERE c.MODALITY\_CODE = 'CR'  GROUP BY b.IMMUNIZATION\_DESCRIPTION) e ON a.IMMUNIZATION\_DESCRIPTION = e.IMMUNIZATION\_DESCRIPTION; |
| Z Result: |  |
| Comments | Any differences on the two results?  The results are identical. |

**SQL Script:**

-- INFO 605 MILESTONE 5

-- G66

-- 1. INGEST DATA -------------------------------------------------------------------------

SELECT \* FROM T\_PATIENT\_IMMUNIZATION;

SELECT \* FROM T\_PATIENT\_IMAGING\_STUDY;

-- 3. RECREATE ----------------------------------------------------------------------------

DROP TABLE Z\_ALLERGY cascade constraints;

DROP TABLE Z\_BODYSITE cascade constraints;

DROP TABLE Z\_CITY cascade constraints;

DROP TABLE Z\_COUNTRY cascade constraints;

DROP TABLE Z\_COUNTY cascade constraints;

DROP TABLE Z\_ETHNICITY cascade constraints;

DROP TABLE Z\_GENDER cascade constraints;

DROP TABLE Z\_IMMUNIZATION cascade constraints;

DROP TABLE Z\_MARITAL\_STATUS cascade constraints;

DROP TABLE Z\_MODALITY cascade constraints;

DROP TABLE Z\_PATIENT cascade constraints;

DROP TABLE Z\_PATIENT\_ALLERGY cascade constraints;

DROP TABLE Z\_PATIENT\_IMAGING\_STUDY cascade constraints;

DROP TABLE Z\_PATIENT\_IMMUNIZATION cascade constraints;

DROP TABLE Z\_RACE cascade constraints;

DROP TABLE Z\_SOP cascade constraints;

DROP TABLE Z\_STATE cascade constraints;

-- tables

-- Table: Z\_ALLERGY

CREATE TABLE Z\_ALLERGY (

ALLERGY\_CODE varchar2(20) NOT NULL,

ALLERGY\_DESCRIPTION varchar2(255) NULL,

CONSTRAINT Z\_ALLERGY\_DESCRIPTION\_UK UNIQUE (ALLERGY\_DESCRIPTION),

CONSTRAINT Z\_ALLERGY\_pk PRIMARY KEY (ALLERGY\_CODE)

) ;

-- Table: Z\_BODYSITE

CREATE TABLE Z\_BODYSITE (

BODYSITE\_CODE varchar2(10) NOT NULL,

BODYSITE\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_BODYSITE\_DESC\_UK UNIQUE (BODYSITE\_DESCRIPTION),

CONSTRAINT Z\_BODYSITE\_pk PRIMARY KEY (BODYSITE\_CODE)

) ;

-- Table: Z\_CITY

CREATE TABLE Z\_CITY (

COUNTRY\_ID number(5) NOT NULL,

STATE\_ID number(5) NOT NULL,

CITY\_ID number(5) NOT NULL,

CITY\_NAME varchar2(50) NOT NULL,

COUNTY\_ID number(5) NULL,

CONSTRAINT Z\_CITY\_NAME\_UK UNIQUE (COUNTRY\_ID, STATE\_ID, CITY\_NAME),

CONSTRAINT Z\_CITY\_pk PRIMARY KEY (COUNTRY\_ID,STATE\_ID,CITY\_ID)

) ;

-- Table: Z\_COUNTRY

CREATE TABLE Z\_COUNTRY (

COUNTRY\_ID number(5) NOT NULL,

COUNTRY\_NAME char(2) NOT NULL,

CONSTRAINT Z\_COUNTRY\_NAME\_UK UNIQUE (COUNTRY\_NAME),

CONSTRAINT Z\_COUNTRY\_pk PRIMARY KEY (COUNTRY\_ID)

) ;

-- Table: Z\_COUNTY

CREATE TABLE Z\_COUNTY (

COUNTRY\_ID number(5) NOT NULL,

STATE\_ID number(5) NOT NULL,

COUNTY\_ID number(5) NOT NULL,

COUNTY\_NAME varchar2(50) NOT NULL,

CONSTRAINT Z\_COUNTY\_NAME\_UK UNIQUE (COUNTRY\_ID, STATE\_ID, COUNTY\_NAME),

CONSTRAINT Z\_COUNTY\_pk PRIMARY KEY (COUNTRY\_ID,STATE\_ID,COUNTY\_ID)

) ;

-- Table: Z\_ETHNICITY

CREATE TABLE Z\_ETHNICITY (

ETHNICITY\_ID number(5) NOT NULL,

ETHNICITY\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_ETHNICITY\_DESC\_UK UNIQUE (ETHNICITY\_DESCRIPTION),

CONSTRAINT Z\_ETHNICITY\_pk PRIMARY KEY (ETHNICITY\_ID)

) ;

-- Table: Z\_GENDER

CREATE TABLE Z\_GENDER (

GENDER\_ID char(1) NOT NULL,

GENDER\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_GENDER\_DESC\_UK UNIQUE (GENDER\_DESCRIPTION),

CONSTRAINT Z\_GENDER\_pk PRIMARY KEY (GENDER\_ID)

) ;

-- Table: Z\_IMMUNIZATION

CREATE TABLE Z\_IMMUNIZATION (

IMMUNIZATION\_CODE varchar2(5) NOT NULL,

IMMUNIZATION\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_IMMUNIZATION\_DESC\_UK UNIQUE (IMMUNIZATION\_DESCRIPTION),

CONSTRAINT Z\_IMMUNIZATION\_pk PRIMARY KEY (IMMUNIZATION\_CODE)

) ;

-- Table: Z\_MARITAL\_STATUS

CREATE TABLE Z\_MARITAL\_STATUS (

MARITAL\_STATUS\_ID char(1) NOT NULL,

MARITAL\_STATUS\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_MARITAL\_STATUS\_DESC\_UK UNIQUE (MARITAL\_STATUS\_DESCRIPTION),

CONSTRAINT Z\_MARITAL\_STATUS\_pk PRIMARY KEY (MARITAL\_STATUS\_ID)

) ;

-- Table: Z\_MODALITY

CREATE TABLE Z\_MODALITY (

MODALITY\_CODE char(2) NOT NULL,

MODALITY\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_MODALITY\_DESC\_UK UNIQUE (MODALITY\_DESCRIPTION),

CONSTRAINT Z\_MODALITY\_pk PRIMARY KEY (MODALITY\_CODE)

) ;

-- Table: Z\_PATIENT

CREATE TABLE Z\_PATIENT (

PATIENT\_ID varchar2(255) NOT NULL,

BIRTHDATE date NOT NULL,

DEATHDATE date NULL,

SSN varchar2(50) NOT NULL,

DRIVERS varchar2(50) NULL,

PASSPORT varchar2(50) NULL,

PREFIX varchar2(50) NULL,

FIRST\_NAME varchar2(50) NOT NULL,

LAST\_NAME varchar2(50) NOT NULL,

SUFFIX varchar2(50) NULL,

MAIDEN\_NAME varchar2(50) NULL,

MARITAL\_STATUS\_ID char(1) NOT NULL,

RACE\_ID number(5) NOT NULL,

ETHNICITY\_ID number(5) NOT NULL,

GENDER\_ID char(1) NOT NULL,

HEALTHCARE\_EXPENSES number(15,2) NOT NULL,

HEALTHCARE\_COVERAGE number(15,2) NOT NULL,

BIRTH\_PLACE\_COUNTRY\_ID number(5) NOT NULL,

BIRTH\_PLACE\_STATE\_ID number(5) NOT NULL,

BIRTH\_PLACE\_CITY\_ID number(5) NOT NULL,

ADDRESS varchar2(255) NOT NULL,

ZIP varchar2(10) NULL,

LIVING\_PLACE\_COUNTRY\_ID number(5) NOT NULL,

LIVING\_PLACE\_STATE\_ID number(5) NOT NULL,

LIVING\_PLACE\_CITY\_ID number(5) NOT NULL,

CONSTRAINT Z\_PATIENT\_pk PRIMARY KEY (PATIENT\_ID)

) ;

-- Table: Z\_PATIENT\_ALLERGY

CREATE TABLE Z\_PATIENT\_ALLERGY (

PATIENT\_ID varchar2(255) NOT NULL,

ALLERGY\_CODE varchar2(20) NOT NULL,

ALLERGY\_START date NOT NULL,

ALLERGY\_STOP date NULL,

CONSTRAINT Z\_PATIENT\_ALLERGY\_pk PRIMARY KEY (PATIENT\_ID,ALLERGY\_CODE,ALLERGY\_START)

) ;

-- Table: Z\_PATIENT\_IMAGING\_STUDY

CREATE TABLE Z\_PATIENT\_IMAGING\_STUDY (

IMAGING\_STUDY\_ID varchar2(255) NOT NULL,

IMAGING\_STUDY\_DATE date NOT NULL,

PATIENT\_ID varchar2(255) NOT NULL,

BODYSITE\_CODE varchar2(10) NOT NULL,

MODALITY\_CODE char(2) NOT NULL,

SOP\_CODE varchar2(30) NOT NULL,

CONSTRAINT Z\_PATIENT\_IMAGING\_STUDY\_pk PRIMARY KEY (IMAGING\_STUDY\_ID)

) ;

-- Table: Z\_PATIENT\_IMMUNIZATION

CREATE TABLE Z\_PATIENT\_IMMUNIZATION (

PATIENT\_ID varchar2(255) NOT NULL,

IMMUNIZATION\_CODE varchar2(5) NOT NULL,

IMMUNIZATION\_DATE date NOT NULL,

BASE\_COST number(15,2) NULL,

CONSTRAINT Z\_PATIENT\_IMMUNIZATION\_pk PRIMARY KEY (PATIENT\_ID,IMMUNIZATION\_CODE,IMMUNIZATION\_DATE)

) ;

-- Table: Z\_RACE

CREATE TABLE Z\_RACE (

RACE\_ID number(5) NOT NULL,

RACE\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_RACE\_DESC\_UK UNIQUE (RACE\_DESCRIPTION),

CONSTRAINT Z\_RACE\_pk PRIMARY KEY (RACE\_ID)

) ;

-- Table: Z\_SOP

CREATE TABLE Z\_SOP (

SOP\_CODE varchar2(30) NOT NULL,

SOP\_DESCRIPTION varchar2(50) NOT NULL,

CONSTRAINT Z\_SOP\_DESC\_UK UNIQUE (SOP\_DESCRIPTION),

CONSTRAINT Z\_SOP\_pk PRIMARY KEY (SOP\_CODE)

) ;

-- Table: Z\_STATE

CREATE TABLE Z\_STATE (

COUNTRY\_ID number(5) NOT NULL,

STATE\_ID number(5) NOT NULL,

STATE\_NAME varchar2(50) NOT NULL,

CONSTRAINT Z\_STATE\_NAME\_UK UNIQUE (COUNTRY\_ID, STATE\_NAME),

CONSTRAINT Z\_STATE\_pk PRIMARY KEY (COUNTRY\_ID,STATE\_ID)

) ;

-- foreign keys

-- Reference: Z\_ALLERGY\_PATIENT\_FK (table: Z\_PATIENT\_ALLERGY)

ALTER TABLE Z\_PATIENT\_ALLERGY ADD CONSTRAINT Z\_ALLERGY\_PATIENT\_FK

FOREIGN KEY (PATIENT\_ID)

REFERENCES Z\_PATIENT (PATIENT\_ID);

-- Reference: Z\_CITY\_COUNTY\_FK (table: Z\_CITY)

ALTER TABLE Z\_CITY ADD CONSTRAINT Z\_CITY\_COUNTY\_FK

FOREIGN KEY (COUNTRY\_ID,STATE\_ID,COUNTY\_ID)

REFERENCES Z\_COUNTY (COUNTRY\_ID,STATE\_ID,COUNTY\_ID);

-- Reference: Z\_CITY\_Z\_STATE (table: Z\_CITY)

ALTER TABLE Z\_CITY ADD CONSTRAINT Z\_CITY\_Z\_STATE

FOREIGN KEY (COUNTRY\_ID,STATE\_ID)

REFERENCES Z\_STATE (COUNTRY\_ID,STATE\_ID);

-- Reference: Z\_COUNTY\_STATE\_FK (table: Z\_COUNTY)

ALTER TABLE Z\_COUNTY ADD CONSTRAINT Z\_COUNTY\_STATE\_FK

FOREIGN KEY (COUNTRY\_ID,STATE\_ID)

REFERENCES Z\_STATE (COUNTRY\_ID,STATE\_ID);

-- Reference: Z\_IMAGING\_STUDY\_PATIENT\_FK (table: Z\_PATIENT\_IMAGING\_STUDY)

ALTER TABLE Z\_PATIENT\_IMAGING\_STUDY ADD CONSTRAINT Z\_IMAGING\_STUDY\_PATIENT\_FK

FOREIGN KEY (PATIENT\_ID)

REFERENCES Z\_PATIENT (PATIENT\_ID);

-- Reference: Z\_IMMUNIZATION\_PATIENT\_FK (table: Z\_PATIENT\_IMMUNIZATION)

ALTER TABLE Z\_PATIENT\_IMMUNIZATION ADD CONSTRAINT Z\_IMMUNIZATION\_PATIENT\_FK

FOREIGN KEY (PATIENT\_ID)

REFERENCES Z\_PATIENT (PATIENT\_ID);

-- Reference: Z\_PATIENT\_ALLERGY\_FK (table: Z\_PATIENT\_ALLERGY)

ALTER TABLE Z\_PATIENT\_ALLERGY ADD CONSTRAINT Z\_PATIENT\_ALLERGY\_FK

FOREIGN KEY (ALLERGY\_CODE)

REFERENCES Z\_ALLERGY (ALLERGY\_CODE);

-- Reference: Z\_PATIENT\_BIRTH\_PLACE\_FK (table: Z\_PATIENT)

ALTER TABLE Z\_PATIENT ADD CONSTRAINT Z\_PATIENT\_BIRTH\_PLACE\_FK

FOREIGN KEY (BIRTH\_PLACE\_COUNTRY\_ID,BIRTH\_PLACE\_STATE\_ID,BIRTH\_PLACE\_CITY\_ID)

REFERENCES Z\_CITY (COUNTRY\_ID,STATE\_ID,CITY\_ID);

-- Reference: Z\_PATIENT\_BODYSITE\_FK (table: Z\_PATIENT\_IMAGING\_STUDY)

ALTER TABLE Z\_PATIENT\_IMAGING\_STUDY ADD CONSTRAINT Z\_PATIENT\_BODYSITE\_FK

FOREIGN KEY (BODYSITE\_CODE)

REFERENCES Z\_BODYSITE (BODYSITE\_CODE);

-- Reference: Z\_PATIENT\_ETHNICITY\_FK (table: Z\_PATIENT)

ALTER TABLE Z\_PATIENT ADD CONSTRAINT Z\_PATIENT\_ETHNICITY\_FK

FOREIGN KEY (ETHNICITY\_ID)

REFERENCES Z\_ETHNICITY (ETHNICITY\_ID);

-- Reference: Z\_PATIENT\_GENDER\_FK (table: Z\_PATIENT)

ALTER TABLE Z\_PATIENT ADD CONSTRAINT Z\_PATIENT\_GENDER\_FK

FOREIGN KEY (GENDER\_ID)

REFERENCES Z\_GENDER (GENDER\_ID);

-- Reference: Z\_PATIENT\_IMMUNIZATION\_FK (table: Z\_PATIENT\_IMMUNIZATION)

ALTER TABLE Z\_PATIENT\_IMMUNIZATION ADD CONSTRAINT Z\_PATIENT\_IMMUNIZATION\_FK

FOREIGN KEY (IMMUNIZATION\_CODE)

REFERENCES Z\_IMMUNIZATION (IMMUNIZATION\_CODE);

-- Reference: Z\_PATIENT\_LIVING\_PLACE\_FK (table: Z\_PATIENT)

ALTER TABLE Z\_PATIENT ADD CONSTRAINT Z\_PATIENT\_LIVING\_PLACE\_FK

FOREIGN KEY (LIVING\_PLACE\_COUNTRY\_ID,LIVING\_PLACE\_STATE\_ID,LIVING\_PLACE\_CITY\_ID)

REFERENCES Z\_CITY (COUNTRY\_ID,STATE\_ID,CITY\_ID);

-- Reference: Z\_PATIENT\_MARITAL\_STATUS\_FK (table: Z\_PATIENT)

ALTER TABLE Z\_PATIENT ADD CONSTRAINT Z\_PATIENT\_MARITAL\_STATUS\_FK

FOREIGN KEY (MARITAL\_STATUS\_ID)

REFERENCES Z\_MARITAL\_STATUS (MARITAL\_STATUS\_ID);

-- Reference: Z\_PATIENT\_MODALITY\_FK (table: Z\_PATIENT\_IMAGING\_STUDY)

ALTER TABLE Z\_PATIENT\_IMAGING\_STUDY ADD CONSTRAINT Z\_PATIENT\_MODALITY\_FK

FOREIGN KEY (MODALITY\_CODE)

REFERENCES Z\_MODALITY (MODALITY\_CODE);

-- Reference: Z\_PATIENT\_RACE\_FK (table: Z\_PATIENT)

ALTER TABLE Z\_PATIENT ADD CONSTRAINT Z\_PATIENT\_RACE\_FK

FOREIGN KEY (RACE\_ID)

REFERENCES Z\_RACE (RACE\_ID);

-- Reference: Z\_PATIENT\_SOP\_FK (table: Z\_PATIENT\_IMAGING\_STUDY)

ALTER TABLE Z\_PATIENT\_IMAGING\_STUDY ADD CONSTRAINT Z\_PATIENT\_SOP\_FK

FOREIGN KEY (SOP\_CODE)

REFERENCES Z\_SOP (SOP\_CODE);

-- Reference: Z\_STATE\_COUTRY\_FK (table: Z\_STATE)

ALTER TABLE Z\_STATE ADD CONSTRAINT Z\_STATE\_COUTRY\_FK

FOREIGN KEY (COUNTRY\_ID)

REFERENCES Z\_COUNTRY (COUNTRY\_ID);

-- End of tables.

-- POPULATE Z\_MARITAL\_STATUS TABLE

INSERT INTO Z\_MARITAL\_STATUS (MARITAL\_STATUS\_ID, MARITAL\_STATUS\_DESCRIPTION)

VALUES ('M', 'Married');

INSERT INTO Z\_MARITAL\_STATUS (MARITAL\_STATUS\_ID, MARITAL\_STATUS\_DESCRIPTION)

VALUES ('S', 'Single');

INSERT INTO Z\_MARITAL\_STATUS (MARITAL\_STATUS\_ID, MARITAL\_STATUS\_DESCRIPTION)

VALUES ('?', 'Uknown');

-- POPULATE Z\_RACE TABLE

INSERT INTO Z\_RACE (RACE\_ID, RACE\_DESCRIPTION)

VALUES (1, 'asian');

INSERT INTO Z\_RACE (RACE\_ID, RACE\_DESCRIPTION)

VALUES (2, 'white');

INSERT INTO Z\_RACE (RACE\_ID, RACE\_DESCRIPTION)

VALUES (3, 'other');

INSERT INTO Z\_RACE (RACE\_ID, RACE\_DESCRIPTION)

VALUES (4, 'native');

INSERT INTO Z\_RACE (RACE\_ID, RACE\_DESCRIPTION)

VALUES (5, 'black');

-- POPULATE Z\_ETHNICITY TABLE

INSERT INTO Z\_ETHNICITY (ETHNICITY\_ID, ETHNICITY\_DESCRIPTION)

VALUES (1, 'nonhispanic');

INSERT INTO Z\_ETHNICITY (ETHNICITY\_ID, ETHNICITY\_DESCRIPTION)

VALUES (2, 'hispanic');

-- POPULATE Z\_GENDER TABLE

INSERT INTO Z\_GENDER (GENDER\_ID, GENDER\_DESCRIPTION)

VALUES ('F', 'Female');

INSERT INTO Z\_GENDER (GENDER\_ID, GENDER\_DESCRIPTION)

VALUES ('M', 'Male');

INSERT INTO Z\_GENDER (GENDER\_ID, GENDER\_DESCRIPTION)

VALUES ('?', 'Unknown');

-- POPULATE Z\_ALLERGY TABLE

INSERT INTO Z\_ALLERGY

SELECT DISTINCT ALLERGY\_CODE, ALLERGY\_DESCRIPTION

FROM T\_PATIENT\_ALLERGY;

-- CREATE TEMPORARY TABLE TO POPULATE Z\_COUNTRY, AND Z\_STATE TABLES

DROP TABLE TMP\_TABLE2;

CREATE TABLE tmp\_table2 (BIRTH\_PLACE\_REVIEWED VARCHAR(100), CITY VARCHAR(100), STATE VARCHAR(100), COUNTRY VARCHAR(100));

INSERT INTO TMP\_TABLE2 (BIRTH\_PLACE\_REVIEWED, CITY, STATE, COUNTRY)

select birth\_place, city, state, country

from (select birth\_place, city, substr(state, 1, instr(state, ' ', 1, 1)-1) as state, country

from (select birth\_place, substr(birth\_place, 1, instr(birth\_place, ' ', 1, 1)-1) as city,

substr(birth\_place, instr(birth\_place, ' ', 1, 1)+2,

instr(birth\_place, ' ',1,2)-2) as state, substr(birth\_place, -2) as country

from t\_patient));

-- POPULATE Z\_COUNTRY TABLE

INSERT INTO Z\_COUNTRY

SELECT ROWNUM, COUNTRY

FROM (SELECT DISTINCT COUNTRY FROM TMP\_TABLE2);

-- POPULATE Z\_STATE TABLE

ALTER TABLE Z\_STATE MODIFY STATE\_NAME varchar2(255);

INSERT INTO Z\_STATE

SELECT COUNTRY\_ID, ROWNUM, nvl(STATE, 'Unknown')

FROM (SELECT DISTINCT b.COUNTRY\_ID, a.STATE

FROM TMP\_TABLE2 a

JOIN Z\_COUNTRY b ON a.COUNTRY = b.COUNTRY\_NAME);

-- POPULATE Z\_COUNTY

INSERT INTO Z\_COUNTY

SELECT COUNTRY\_ID, STATE\_ID, ROWNUM, COUNTY

FROM (SELECT DISTINCT b.COUNTY, a.COUNTRY\_ID, a.STATE\_ID

FROM Z\_STATE a

JOIN T\_PATIENT b ON a.STATE\_NAME = b.STATE);

-- CREATE A TEMPORARY TABLE TO COMBINE ALL CITY NAMES

DROP TABLE TMP\_TABLE\_CITY4;

CREATE TABLE TMP\_TABLE\_CITY4 (CITY VARCHAR2(255), STATE VARCHAR2(255));

INSERT INTO TMP\_TABLE\_CITY4 (CITY, STATE)

select distinct city, STATE

from tmp\_table2;

INSERT INTO TMP\_TABLE\_CITY4 (CITY, STATE)

SELECT DISTINCT CITY, STATE

FROM T\_PATIENT;

select \* from tmp\_table\_city4;

-- POPULATE Z\_CITY

INSERT INTO Z\_CITY

SELECT COUNTRY\_ID, STATE\_ID, ROWNUM, CITY, COUNTY\_ID

FROM (SELECT COUNTRY\_ID, STATE\_ID, CITY,

CASE WHEN COUNTRY\_ID != 27 THEN NULL

WHEN COUNTRY\_ID = 27 THEN COUNTY\_ID

END AS COUNTY\_ID

FROM (SELECT DISTINCT b.COUNTRY\_ID, b.STATE\_ID, a.CITY, d.COUNTY\_ID

FROM TMP\_TABLE\_CITY4 a

JOIN Z\_STATE b ON a.STATE = b.STATE\_NAME

FULL OUTER JOIN T\_PATIENT c ON a.CITY = c.CITY

FULL OUTER JOIN Z\_COUNTY d ON c.COUNTY = d.COUNTY\_NAME));

-- CREATE A TEMPORARY TABLE INCLUDING STATE\_ID AND COUNTRY\_ID TO BE USED TO POPULATE Z\_PATIENT TABLE

DROP TABLE TMP\_TABLE3;

CREATE TABLE tmp\_table3 (BIRTH\_PLACE\_REVIEWED VARCHAR(100), CITY VARCHAR(100), STATE VARCHAR(100), STATE\_ID NUMBER(5), COUNTRY VARCHAR(100), COUNTRY\_ID NUMBER(5));

INSERT INTO TMP\_TABLE3 (BIRTH\_PLACE\_REVIEWED, CITY, STATE, STATE\_ID, COUNTRY, COUNTRY\_ID)

select a.birth\_place, a.city, a.state, b.state\_id, a.country, b.country\_id

from (select birth\_place, city, substr(state, 1, instr(state, ' ', 1, 1)-1) as state, country

from (select birth\_place, substr(birth\_place, 1, instr(birth\_place, ' ', 1, 1)-1) as city, substr(birth\_place, instr(birth\_place, ' ', 1, 1)+2, instr(birth\_place, ' ',1,2)-2) as state, substr(birth\_place, -2) as country

from t\_patient)) a

join Z\_STATE b on a.state = b.state\_name;

-- POPULATE Z\_PATIENT TABLE

DROP TABLE TMP\_LIVING;

CREATE TABLE TMP\_LIVING (LIVING\_PLACE\_CITY VARCHAR2(50), LIVING\_PLACE\_CITY\_ID NUMBER(5), LIVING\_PLACE\_STATE VARCHAR2(100), LIVING\_PLACE\_STATE\_ID NUMBER(5), LIVING\_PLACE\_COUNTRY\_ID NUMBER(5));

INSERT INTO TMP\_LIVING

SELECT a.CITY\_NAME, a.CITY\_ID, b.STATE\_NAME, b.STATE\_ID, b.COUNTRY\_ID

FROM Z\_CITY a

JOIN Z\_STATE b ON a.STATE\_ID = b.STATE\_ID;

DROP TABLE TMP\_BIRTH\_PLACE\_IDS;

CREATE TABLE TMP\_BIRTH\_PLACE\_IDS (BIRTH\_PLACE\_REVIEWED VARCHAR2(255), BIRTH\_PLACE\_CITY VARCHAR2(50), BIRTH\_PLACE\_CITY\_ID NUMBER(5), BIRTH\_PLACE\_STATE VARCHAR2(100),

BIRTH\_PLACE\_STATE\_ID NUMBER(5), BIRTH\_PLACE\_COUNTRY VARCHAR2(50), BIRTH\_PLACE\_COUNTRY\_ID NUMBER(5));

INSERT INTO TMP\_BIRTH\_PLACE\_IDS

SELECT a.BIRTH\_PLACE\_REVIEWED, a.CITY, b.CITY\_ID, a.STATE, a.STATE\_ID, a.COUNTRY, a.COUNTRY\_ID

FROM TMP\_TABLE3 a

JOIN Z\_CITY b ON a.CITY = b.CITY\_NAME AND a.STATE\_ID = b.STATE\_ID;

INSERT INTO Z\_PATIENT

SELECT DISTINCT a.PATIENT\_ID, nvl(a.BIRTHDATE, '01-JAN-9999') AS BIRTHDATE,

a.DEATHDATE, nvl(a.SSN, '999-99-9999')AS SSN, a.DRIVERS,

a.PASSPORT, a.PREFIX, nvl(a.FIRST\_NAME, 'Unknown') AS FIRST\_NAME,

nvl(a.LAST\_NAME, 'Unknown') AS LAST\_NAME, a.SUFFIX,

a.MAIDEN\_NAME, nvl(a.MARITAL\_STATUS, '?') AS MARITAL\_STATUS\_ID,

b.RACE\_ID, c.ETHNICITY\_ID, a.GENDER, a.HEALTHCARE\_EXPENSES,

a.HEALTHCARE\_COVERAGE, d.BIRTH\_PLACE\_COUNTRY\_ID, d.BIRTH\_PLACE\_STATE\_ID, d.BIRTH\_PLACE\_CITY\_ID,

a.ADDRESS, nvl(a.ZIP, 'Unknown') AS ZIP, e.LIVING\_PLACE\_COUNTRY\_ID, e.LIVING\_PLACE\_STATE\_ID, e.LIVING\_PLACE\_CITY\_ID

FROM T\_PATIENT a

JOIN Z\_RACE b ON a.RACE = b.RACE\_DESCRIPTION

JOIN Z\_ETHNICITY c ON a.ETHNICITY = c.ETHNICITY\_DESCRIPTION

JOIN TMP\_BIRTH\_PLACE\_IDS d ON a.BIRTH\_PLACE = d.BIRTH\_PLACE\_REVIEWED

JOIN TMP\_LIVING e ON a.CITY = e.LIVING\_PLACE\_CITY AND a.STATE = e.LIVING\_PLACE\_STATE;

-- POPULATE Z\_PATIENT\_ALLERGY TABLE

INSERT INTO Z\_PATIENT\_ALLERGY

SELECT a.PATIENT\_ID, b.ALLERGY\_CODE, b.ALERGY\_START, b.ALLERGY\_STOP

FROM Z\_PATIENT a

JOIN T\_PATIENT\_ALLERGY b ON a.PATIENT\_ID = b.PATIENT\_ID;

-- 2. NORMALIZATION -----------------------------------------------------------------------

-- POPULATE Z\_SOP TABLE

INSERT INTO Z\_SOP

SELECT DISTINCT SOP\_CODE, MIN(SOP\_DESCRIPTION)

FROM T\_PATIENT\_IMAGING\_STUDY

GROUP BY SOP\_CODE

ORDER BY 1;

INSERT INTO Z\_SOP

VALUES ('?', 'Unknown');

-- POPULATE Z\_MODALITY TABLE

INSERT INTO Z\_MODALITY

SELECT DISTINCT MODALITY\_CODE, MODALITY\_DESCRIPTION

FROM T\_PATIENT\_IMAGING\_STUDY;

-- POPULATE Z\_BODYSITE TABLE

INSERT INTO Z\_BODYSITE

SELECT BODYSITE\_CODE, MIN(BODYSITE\_DESCRIPTION)

FROM T\_PATIENT\_IMAGING\_STUDY

GROUP BY BODYSITE\_CODE

ORDER BY 1;

INSERT INTO Z\_BODYSITE

VALUES ('?', 'Unknown');

-- POPULATE Z\_IMMUNIZATION TABLE

INSERT INTO Z\_IMMUNIZATION

SELECT ROWNUM, IMMUNIZATION\_DESCRIPTION

FROM (SELECT DISTINCT IMMUNIZATION\_DESCRIPTION

FROM T\_PATIENT\_IMMUNIZATION);

-- POPULATE Z\_PATIENT\_IMAGING\_STUDY TABLE

INSERT INTO Z\_PATIENT\_IMAGING\_STUDY

SELECT ROWNUM, IMAGING\_STUDY\_DATE, PATIENT\_ID, NVL(BODYSITE\_CODE, '?'), MODALITY\_CODE, NVL(SOP\_CODE, '?')

FROM (SELECT DISTINCT a.IMAGING\_STUDY\_DATE, e.PATIENT\_ID, b.BODYSITE\_CODE, c.MODALITY\_CODE, d.SOP\_CODE

FROM T\_PATIENT\_IMAGING\_STUDY a

FULL OUTER JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE

FULL OUTER JOIN Z\_MODALITY c ON a.MODALITY\_DESCRIPTION = c.MODALITY\_DESCRIPTION

FULL OUTER JOIN Z\_SOP d ON a.SOP\_CODE = d.SOP\_CODE

JOIN Z\_PATIENT e ON a.PATIENT\_ID = e.PATIENT\_ID);

-- POPULATE Z\_PATIENT\_IMMUNIZATION TABLE

INSERT INTO Z\_PATIENT\_IMMUNIZATION

SELECT DISTINCT c.PATIENT\_ID, b.IMMUNIZATION\_CODE, a.IMMUNIZATION\_DATE, a.BASE\_COST

FROM T\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION

JOIN Z\_PATIENT c ON a.PATIENT\_ID = c.PATIENT\_ID;

-- CHECKS

-- CHECK 1:

SELECT 1, count(\*) FROM Z\_COUNTRY UNION ALL

SELECT 2, count(\*) FROM Z\_STATE UNION ALL

SELECT 3, count(\*) FROM Z\_COUNTY UNION ALL

SELECT 4, count(\*) FROM Z\_CITY

ORDER BY 1;

-- CHECK 2:

SELECT COUNTRY\_ID

, STATE\_ID

, count(\*)

, count(distinct COUNTY\_ID)

FROM Z\_CITY

GROUP BY COUNTRY\_ID, STATE\_ID

ORDER BY 3 desc;

-- CHECK 3:

SELECT 1, 0, count(\*)

FROM T\_PATIENT

UNION ALL

SELECT 2, BIRTH\_PLACE\_COUNTRY\_ID, count(\*)

FROM Z\_PATIENT

GROUP BY BIRTH\_PLACE\_COUNTRY\_ID

ORDER BY 1,3 desc;

-- 4. SQL (QUERIES) -------------------------------------------------------------------------------------

-- PART 1: IMMUNIAZATION

-- Question 1: What is the distribution of race regarding immunization record for Influenza?

SELECT a.RACE, COUNT(b.IMMUNIZATION\_DESCRIPTION)

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE b.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'

GROUP BY a.RACE;

SELECT b.RACE\_DESCRIPTION, COUNT(c.IMMUNIZATION\_CODE)

FROM Z\_PATIENT a

JOIN Z\_RACE b ON a.RACE\_ID = b.RACE\_ID

JOIN Z\_PATIENT\_IMMUNIZATION c ON a.PATIENT\_ID = c.PATIENT\_ID

JOIN Z\_IMMUNIZATION d ON c.IMMUNIZATION\_CODE = d.IMMUNIZATION\_CODE

WHERE d.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'

GROUP BY b.RACE\_DESCRIPTION;

-- Question 2: What is the top-3 immunization that covers the age of 18 or below rather than Influenza?

SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*)

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) <=18 AND b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

GROUP BY b.IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC

FETCH FIRST 3 ROWS ONLY;

SELECT c.IMMUNIZATION\_DESCRIPTION, COUNT(\*)

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE

WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) <= 18 AND c.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

GROUP BY c.IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC

FETCH FIRST 3 ROWS ONLY;

-- Question 3: What is the top 5 immunizations that cover the age range [20-25] rather than Influenza?

SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*)

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) >= 20 AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) <= 25

AND b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

GROUP BY b.IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC

FETCH FIRST 5 ROWS ONLY;

SELECT c.IMMUNIZATION\_DESCRIPTION, COUNT(\*)

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE

WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) >= 20 AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) <= 25

AND c.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

GROUP BY c.IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC

FETCH FIRST 5 ROWS ONLY;

-- Question 4: Which living county has the most immunization coverage for DTaP?

SELECT a.COUNTY, COUNT(\*)

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE b.IMMUNIZATION\_DESCRIPTION = 'DTaP'

GROUP BY a.COUNTY

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

SELECT c.COUNTY\_NAME, COUNT(\*)

FROM Z\_PATIENT a

JOIN Z\_CITY b ON a.LIVING\_PLACE\_CITY\_ID = b.CITY\_ID

JOIN Z\_COUNTY c ON b.COUNTY\_ID = c.COUNTY\_ID

JOIN Z\_PATIENT\_IMMUNIZATION d ON a.PATIENT\_ID = d.PATIENT\_ID

JOIN Z\_IMMUNIZATION e ON d.IMMUNIZATION\_CODE = e.IMMUNIZATION\_CODE

WHERE e.IMMUNIZATION\_DESCRIPTION = 'DTaP'

GROUP BY c.COUNTY\_NAME

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

-- Question 5: Which specific immunization for Hepatitis A or B was most taken by female patients?

SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*)

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE a.GENDER = 'F' AND b.IMMUNIZATION\_DESCRIPTION LIKE 'Hep%'

GROUP BY b.IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

SELECT c.IMMUNIZATION\_DESCRIPTION, COUNT(\*)

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE

WHERE a.GENDER\_ID = 'F' AND c.IMMUNIZATION\_DESCRIPTION LIKE 'Hep%'

GROUP BY c.IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

-- Question 6: Number of immunizations have reduced from 2019 to 2020 due to COVID. Which ones are the top-3 immunizations with higher decreasing ratio rather than Influenza?

SELECT a.IMMUNIZATION\_DESCRIPTION, b.COUNT\_2020, a.COUNT\_2019, ROUND(((b.COUNT\_2020 / a.COUNT\_2019 ) - 1)\*100,2) AS PERCENT\_CHANGE

FROM (SELECT IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2019

FROM T\_PATIENT\_IMMUNIZATION

WHERE IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

AND IMMUNIZATION\_DATE LIKE '%-19'

GROUP BY IMMUNIZATION\_DESCRIPTION) a

JOIN (SELECT IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2020

FROM T\_PATIENT\_IMMUNIZATION

WHERE IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

AND IMMUNIZATION\_DATE LIKE '%-20'

GROUP BY IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION

ORDER BY PERCENT\_CHANGE

FETCH FIRST 3 ROWS ONLY;

SELECT a.IMMUNIZATION\_DESCRIPTION, b.COUNT\_2020, a.COUNT\_2019, ROUND(((b.COUNT\_2020 / a.COUNT\_2019 ) - 1)\*100,2) AS PERCENT\_CHANGE

FROM (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2019

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

WHERE b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

AND a.IMMUNIZATION\_DATE LIKE '%-19'

GROUP BY b.IMMUNIZATION\_DESCRIPTION) a

JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS COUNT\_2020

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

WHERE b.IMMUNIZATION\_DESCRIPTION != 'Influenza seasonal injectable preservative free'

AND a.IMMUNIZATION\_DATE LIKE '%-20'

GROUP BY b.IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION

ORDER BY PERCENT\_CHANGE

FETCH FIRST 3 ROWS ONLY;

-- Question 7: When is the peak season (month) that patients got immunization for Influenza in 2019? Was it the same month in 2020?

SELECT substr(IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2019

FROM T\_PATIENT\_IMMUNIZATION

WHERE IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'

AND IMMUNIZATION\_DATE LIKE '%-19'

GROUP BY substr(IMMUNIZATION\_DATE,4,3)

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

SELECT substr(IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2020

FROM T\_PATIENT\_IMMUNIZATION

WHERE IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'

AND IMMUNIZATION\_DATE LIKE '%-20'

GROUP BY substr(IMMUNIZATION\_DATE,4,3)

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

SELECT substr(a.IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2019

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

WHERE b.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'

AND a.IMMUNIZATION\_DATE LIKE '%-19'

GROUP BY substr(a.IMMUNIZATION\_DATE,4,3)

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

SELECT substr(a.IMMUNIZATION\_DATE,4,3) AS IMMUNIZATION\_MONTH, COUNT(\*) AS COUNT\_2020

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

WHERE b.IMMUNIZATION\_DESCRIPTION = 'Influenza seasonal injectable preservative free'

AND a.IMMUNIZATION\_DATE LIKE '%-20'

GROUP BY substr(a.IMMUNIZATION\_DATE,4,3)

ORDER BY COUNT(\*) DESC

FETCH FIRST 1 ROWS ONLY;

-- Question 8: How many patients don't have any immunization records?

SELECT (a.ALL\_PATIENTS - b.IMMUNIZED\_PATIENTS) AS NOT\_IMMUNIZED

FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS

FROM T\_PATIENT) a,

(SELECT COUNT(UNIQUE(PATIENT\_ID)) AS IMMUNIZED\_PATIENTS

FROM T\_PATIENT\_IMMUNIZATION) b;

SELECT (a.ALL\_PATIENTS - b.IMMUNIZED\_PATIENTS) AS NOT\_IMMUNIZED

FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS

FROM Z\_PATIENT) a,

(SELECT COUNT(UNIQUE(PATIENT\_ID)) AS IMMUNIZED\_PATIENTS

FROM Z\_PATIENT\_IMMUNIZATION) b;

-- Question 9: How many patients don't have immunization records per type of immunization?

SELECT b.IMMUNIZATION\_DESCRIPTION, (a.ALL\_PATIENTS - b.IMMUNIZED) AS NOT\_IMMUNIZED

FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS

FROM T\_PATIENT) a,

(SELECT IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(PATIENT\_ID)) AS IMMUNIZED

FROM T\_PATIENT\_IMMUNIZATION

GROUP BY IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(\*) DESC) b

ORDER BY NOT\_IMMUNIZED DESC;

SELECT b.IMMUNIZATION\_DESCRIPTION, (a.ALL\_PATIENTS - b.IMMUNIZED) AS NOT\_IMMUNIZED

FROM (SELECT COUNT(PATIENT\_ID) AS ALL\_PATIENTS

FROM Z\_PATIENT) a,

(SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(a.PATIENT\_ID)) AS IMMUNIZED

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

GROUP BY b.IMMUNIZATION\_DESCRIPTION

ORDER BY IMMUNIZED DESC) b

ORDER BY NOT\_IMMUNIZED DESC;

-- Question 10: How many patients don't have immunization record per type of immunization, considering the min/max age that each immunization is usually given?

SELECT IMMUNIZATION\_DESCRIPTION, MIN\_AGE, MAX\_AGE, IMMUNIZED\_COUNT, ALL\_PATIENTS, (ALL\_PATIENTS - IMMUNIZED\_COUNT) AS NOT\_IMMUNIZED\_COUNT

FROM (SELECT a.IMMUNIZATION\_DESCRIPTION, a.MIN\_AGE, a.MAX\_AGE, a.IMMUNIZED\_COUNT, b.ALL\_PATIENTS

FROM (SELECT b.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

GROUP BY b.IMMUNIZATION\_DESCRIPTION) a

JOIN (SELECT b.MIN\_AGE, b.MAX\_AGE, COUNT(a.PATIENT\_ID) AS ALL\_PATIENTS

FROM T\_PATIENT a,

(SELECT b.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

GROUP BY b.IMMUNIZATION\_DESCRIPTION) b

WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) > MIN\_AGE AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) < MAX\_AGE

GROUP BY b.MIN\_AGE, b.MAX\_AGE) b ON a.MIN\_AGE = b.MIN\_AGE AND a.MAX\_AGE = b.MAX\_AGE);

SELECT a.IMMUNIZATION\_DESCRIPTION, a.MIN\_AGE, a.MAX\_AGE, a.IMMUNIZED\_COUNT, b.ALL\_PATIENTS, (b.ALL\_PATIENTS - a.IMMUNIZED\_COUNT) AS NOT\_IMMUNIZED\_COUNT

FROM (SELECT c.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE

GROUP BY c.IMMUNIZATION\_DESCRIPTION) a

JOIN (SELECT b.MIN\_AGE, b.MAX\_AGE, COUNT(a.PATIENT\_ID) AS ALL\_PATIENTS

FROM Z\_PATIENT a,

(SELECT c.IMMUNIZATION\_DESCRIPTION, MIN(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MIN\_AGE, MAX(ROUND((SYSDATE - a.BIRTHDATE)/365,0)) AS MAX\_AGE, COUNT(UNIQUE(b.PATIENT\_ID)) AS IMMUNIZED\_COUNT

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMMUNIZATION b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_IMMUNIZATION c ON b.IMMUNIZATION\_CODE = c.IMMUNIZATION\_CODE

GROUP BY c.IMMUNIZATION\_DESCRIPTION) b

WHERE ROUND((SYSDATE - a.BIRTHDATE)/365,0) > MIN\_AGE AND ROUND((SYSDATE - a.BIRTHDATE)/365,0) < MAX\_AGE

GROUP BY b.MIN\_AGE, b.MAX\_AGE) b ON a.MIN\_AGE = b.MIN\_AGE AND a.MAX\_AGE = b.MAX\_AGE;

-- Challenge 1: For each immunization, show how many patients took more than one does of it. Result must be presented in 2 columns only: Immunization and number of patients.

SELECT IMMUNIZATION\_DESCRIPTION, COUNT(PATIENT\_ID) AS NUM\_PATIENTS

FROM (SELECT PATIENT\_ID, IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(IMMUNIZATION\_DATE)) AS DOSE\_COUNT

FROM T\_PATIENT\_IMMUNIZATION

GROUP BY PATIENT\_ID, IMMUNIZATION\_DESCRIPTION

ORDER BY PATIENT\_ID, IMMUNIZATION\_DESCRIPTION)

WHERE DOSE\_COUNT > 1

GROUP BY IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(PATIENT\_ID) DESC;

SELECT IMMUNIZATION\_DESCRIPTION, COUNT(PATIENT\_ID) AS NUM\_PATIENTS

FROM (SELECT a.PATIENT\_ID, b.IMMUNIZATION\_DESCRIPTION, COUNT(UNIQUE(IMMUNIZATION\_DATE)) AS DOSE\_COUNT

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

GROUP BY a.PATIENT\_ID, b.IMMUNIZATION\_DESCRIPTION

ORDER BY a.PATIENT\_ID, b.IMMUNIZATION\_DESCRIPTION)

WHERE DOSE\_COUNT > 1

GROUP BY IMMUNIZATION\_DESCRIPTION

ORDER BY COUNT(PATIENT\_ID) DESC;

-- PART 2: IMAGING STUDIES

-- Question 1: What is the most common type of imaging study (modality) in the period 2001-2010 comparing to 2011-2020?

SELECT a.MODALITY\_DESCRIPTION, a.COUNT\_2001\_2010, b.COUNT\_2011\_2020

FROM (SELECT MODALITY\_DESCRIPTION, COUNT(\*) AS COUNT\_2001\_2010

FROM T\_PATIENT\_IMAGING\_STUDY

WHERE IMAGING\_STUDY\_DATE > '01-JAN-01' AND IMAGING\_STUDY\_DATE < '31-DEC-10'

GROUP BY MODALITY\_DESCRIPTION) a

JOIN (SELECT MODALITY\_DESCRIPTION, COUNT(\*) AS COUNT\_2011\_2020

FROM T\_PATIENT\_IMAGING\_STUDY

WHERE IMAGING\_STUDY\_DATE > '01-JAN-11' AND IMAGING\_STUDY\_DATE < '31-DEC-20'

GROUP BY MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION

ORDER BY a.COUNT\_2001\_2010 DESC

FETCH FIRST 1 ROWS ONLY;

SELECT a.MODALITY\_DESCRIPTION, a.COUNT\_2001\_2010, b.COUNT\_2011\_2020

FROM (SELECT b.MODALITY\_DESCRIPTION, COUNT(a.PATIENT\_ID) AS COUNT\_2001\_2010

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_MODALITY b ON a.MODALITY\_CODE = b.MODALITY\_CODE

WHERE a.IMAGING\_STUDY\_DATE > '01-JAN-01' AND a.IMAGING\_STUDY\_DATE < '31-DEC-10'

GROUP BY b.MODALITY\_DESCRIPTION) a

JOIN (SELECT b.MODALITY\_DESCRIPTION, COUNT(a.PATIENT\_ID) AS COUNT\_2011\_2020

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_MODALITY b ON a.MODALITY\_CODE = b.MODALITY\_CODE

WHERE a.IMAGING\_STUDY\_DATE > '01-JAN-11' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20'

GROUP BY b.MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION

ORDER BY a.COUNT\_2001\_2010 DESC

FETCH FIRST 1 ROWS ONLY;

-- Question 2: What are the three most common type of imaging study (modality) for each gender in 2015?

SELECT a.MODALITY\_DESCRIPTION, a.MALE\_COUNT, b.FEMALE\_COUNT

FROM (SELECT b.MODALITY\_DESCRIPTION, COUNT(\*) AS MALE\_COUNT

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE a.GENDER = 'M' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'

GROUP BY b.MODALITY\_DESCRIPTION) a

JOIN (SELECT b.MODALITY\_DESCRIPTION, COUNT(\*) AS FEMALE\_COUNT

FROM T\_PATIENT a

JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE a.GENDER = 'F' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'

GROUP BY b.MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION

ORDER BY a.MALE\_COUNT DESC

FETCH FIRST 3 ROWS ONLY;

SELECT a.MODALITY\_DESCRIPTION, a.MALE\_COUNT, b.FEMALE\_COUNT

FROM (SELECT c.MODALITY\_DESCRIPTION, COUNT(b.PATIENT\_ID) AS MALE\_COUNT

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_MODALITY c ON b.MODALITY\_CODE = c.MODALITY\_CODE

WHERE a.GENDER\_ID = 'M' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'

GROUP BY c.MODALITY\_DESCRIPTION) a

JOIN (SELECT c.MODALITY\_DESCRIPTION, COUNT(b.PATIENT\_ID) AS FEMALE\_COUNT

FROM Z\_PATIENT a

JOIN Z\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

JOIN Z\_MODALITY c ON b.MODALITY\_CODE = c.MODALITY\_CODE

WHERE a.GENDER\_ID = 'F' AND b.IMAGING\_STUDY\_DATE >= '01-JAN-15' AND b.IMAGING\_STUDY\_DATE <= '31-DEC-15'

GROUP BY c.MODALITY\_DESCRIPTION) b ON a.MODALITY\_DESCRIPTION = b.MODALITY\_DESCRIPTION

ORDER BY a.MALE\_COUNT DESC

FETCH FIRST 3 ROWS ONLY;

-- Question 3: In which year was each type of imaging study (modality) introduced in the hospital?

SELECT MODALITY\_DESCRIPTION, substr(MIN(IMAGING\_STUDY\_DATE),8,2) AS START\_YEAR

FROM T\_PATIENT\_IMAGING\_STUDY

GROUP BY MODALITY\_DESCRIPTION;

SELECT b.MODALITY\_DESCRIPTION, substr(MIN(a.IMAGING\_STUDY\_DATE),8,2) AS START\_YEAR

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_MODALITY b ON a.MODALITY\_CODE = b.MODALITY\_CODE

GROUP BY b.MODALITY\_DESCRIPTION;

-- Question 4: Report the number of imaging studies (each modality in one different column) per body site (in rows).

SELECT UNIQUE(a.BODYSITE\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY a

FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS CT\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY

WHERE MODALITY\_CODE = 'CT'

GROUP BY BODYSITE\_DESCRIPTION) b ON a.BODYSITE\_DESCRIPTION = b.BODYSITE\_DESCRIPTION

FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS DX\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY

WHERE MODALITY\_CODE = 'DX'

GROUP BY BODYSITE\_DESCRIPTION) c ON a.BODYSITE\_DESCRIPTION = c.BODYSITE\_DESCRIPTION

FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS US\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY

WHERE MODALITY\_CODE = 'US'

GROUP BY BODYSITE\_DESCRIPTION) d ON a.BODYSITE\_DESCRIPTION = d.BODYSITE\_DESCRIPTION

FULL OUTER JOIN (SELECT BODYSITE\_DESCRIPTION, COUNT(\*) AS CR\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY

WHERE MODALITY\_CODE = 'CR'

GROUP BY BODYSITE\_DESCRIPTION) e ON a.BODYSITE\_DESCRIPTION = e.BODYSITE\_DESCRIPTION;

SELECT UNIQUE(a.BODYSITE\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT

FROM Z\_BODYSITE a

FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS CT\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE

WHERE a.MODALITY\_CODE = 'CT'

GROUP BY b.BODYSITE\_DESCRIPTION) b ON a.BODYSITE\_DESCRIPTION = b.BODYSITE\_DESCRIPTION

FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS DX\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE

WHERE a.MODALITY\_CODE = 'DX'

GROUP BY b.BODYSITE\_DESCRIPTION) c ON a.BODYSITE\_DESCRIPTION = c.BODYSITE\_DESCRIPTION

FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS US\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE

WHERE a.MODALITY\_CODE = 'US'

GROUP BY b.BODYSITE\_DESCRIPTION) d ON a.BODYSITE\_DESCRIPTION = d.BODYSITE\_DESCRIPTION

FULL OUTER JOIN (SELECT b.BODYSITE\_DESCRIPTION, COUNT(\*) AS CR\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

JOIN Z\_BODYSITE b ON a.BODYSITE\_CODE = b.BODYSITE\_CODE

WHERE a.MODALITY\_CODE = 'CR'

GROUP BY b.BODYSITE\_DESCRIPTION) e ON a.BODYSITE\_DESCRIPTION = e.BODYSITE\_DESCRIPTION;

-- Question 5: Report the average age (in years) of patients per imaging studies (each modality in one different column) for each 10-year period (in rows).

SELECT a.TIME\_PERIOD, a.CT\_COUNT, b.DX\_COUNT, c.US\_COUNT, d.CR\_COUNT

FROM (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS CT\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'CT'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) a

JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS DX\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'DX'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) b ON a.TIME\_PERIOD = b.TIME\_PERIOD

JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS US\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'US'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) c ON a.TIME\_PERIOD = c.TIME\_PERIOD

JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS CR\_COUNT

FROM T\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'CR'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) d ON a.TIME\_PERIOD = d.TIME\_PERIOD;

SELECT a.TIME\_PERIOD, a.CT\_COUNT, b.DX\_COUNT, c.US\_COUNT, d.CR\_COUNT

FROM (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS CT\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'CT'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) a

JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS DX\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'DX'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) b ON a.TIME\_PERIOD = b.TIME\_PERIOD

JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS US\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'US'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) c ON a.TIME\_PERIOD = c.TIME\_PERIOD

JOIN (SELECT CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END AS TIME\_PERIOD, COUNT(\*) AS CR\_COUNT

FROM Z\_PATIENT\_IMAGING\_STUDY a

WHERE a.MODALITY\_CODE = 'CR'

GROUP BY CASE WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-24' AND a.IMAGING\_STUDY\_DATE < '31-DEC-29' THEN '1920s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-30' AND a.IMAGING\_STUDY\_DATE < '31-DEC-39' THEN '1930s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-40' AND a.IMAGING\_STUDY\_DATE < '31-DEC-49' THEN '1940s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-50' AND a.IMAGING\_STUDY\_DATE < '31-DEC-59' THEN '1950s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-60' AND a.IMAGING\_STUDY\_DATE < '31-DEC-69' THEN '1960s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-70' AND a.IMAGING\_STUDY\_DATE < '31-DEC-79' THEN '1970s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-80' AND a.IMAGING\_STUDY\_DATE < '31-DEC-89' THEN '1980s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-90' AND a.IMAGING\_STUDY\_DATE < '31-DEC-99' THEN '1990s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-00' AND a.IMAGING\_STUDY\_DATE < '31-DEC-09' THEN '2000s'

WHEN a.IMAGING\_STUDY\_DATE > '01-JAN-10' AND a.IMAGING\_STUDY\_DATE < '31-DEC-20' THEN '2010s'

END) d ON a.TIME\_PERIOD = d.TIME\_PERIOD;

-- Challenge 2: Report the number of patients that have taken each immunization (rows) per imaging studies (each modality in one different column) - duplicate counts can happen in this report.

SELECT UNIQUE(a.IMMUNIZATION\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT

FROM T\_PATIENT\_IMMUNIZATION a

FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS CT\_COUNT

FROM T\_PATIENT\_IMMUNIZATION a

FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE b.MODALITY\_CODE = 'CT'

GROUP BY a.IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION

FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS DX\_COUNT

FROM T\_PATIENT\_IMMUNIZATION a

FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE b.MODALITY\_CODE = 'DX'

GROUP BY a.IMMUNIZATION\_DESCRIPTION) c ON a.IMMUNIZATION\_DESCRIPTION = c.IMMUNIZATION\_DESCRIPTION

FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS US\_COUNT

FROM T\_PATIENT\_IMMUNIZATION a

FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE b.MODALITY\_CODE = 'US'

GROUP BY a.IMMUNIZATION\_DESCRIPTION) d ON a.IMMUNIZATION\_DESCRIPTION = d.IMMUNIZATION\_DESCRIPTION

FULL OUTER JOIN (SELECT a.IMMUNIZATION\_DESCRIPTION, COUNT(\*) AS CR\_COUNT

FROM T\_PATIENT\_IMMUNIZATION a

FULL OUTER JOIN T\_PATIENT\_IMAGING\_STUDY b ON a.PATIENT\_ID = b.PATIENT\_ID

WHERE b.MODALITY\_CODE = 'CR'

GROUP BY a.IMMUNIZATION\_DESCRIPTION) e ON a.IMMUNIZATION\_DESCRIPTION = e.IMMUNIZATION\_DESCRIPTION;

SELECT UNIQUE(a.IMMUNIZATION\_DESCRIPTION), b.CT\_COUNT, c.DX\_COUNT, d.US\_COUNT, e.CR\_COUNT

FROM Z\_IMMUNIZATION a

FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) CT\_COUNT

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID

WHERE c.MODALITY\_CODE = 'CT'

GROUP BY b.IMMUNIZATION\_DESCRIPTION) b ON a.IMMUNIZATION\_DESCRIPTION = b.IMMUNIZATION\_DESCRIPTION

FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) DX\_COUNT

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID

WHERE c.MODALITY\_CODE = 'DX'

GROUP BY b.IMMUNIZATION\_DESCRIPTION) c ON a.IMMUNIZATION\_DESCRIPTION = c.IMMUNIZATION\_DESCRIPTION

FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) US\_COUNT

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID

WHERE c.MODALITY\_CODE = 'US'

GROUP BY b.IMMUNIZATION\_DESCRIPTION) d ON a.IMMUNIZATION\_DESCRIPTION = d.IMMUNIZATION\_DESCRIPTION

FULL OUTER JOIN (SELECT b.IMMUNIZATION\_DESCRIPTION, COUNT(\*) CR\_COUNT

FROM Z\_PATIENT\_IMMUNIZATION a

JOIN Z\_IMMUNIZATION b ON a.IMMUNIZATION\_CODE = b.IMMUNIZATION\_CODE

FULL OUTER JOIN Z\_PATIENT\_IMAGING\_STUDY c ON a.PATIENT\_ID = c.PATIENT\_ID

WHERE c.MODALITY\_CODE = 'CR'

GROUP BY b.IMMUNIZATION\_DESCRIPTION) e ON a.IMMUNIZATION\_DESCRIPTION = e.IMMUNIZATION\_DESCRIPTION;