**Project:** Synthetic Clinical Patient Database

**Team G66: Allie Schneider, Francis Villamater, Andrew Chen**

**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**.

|  |  |
| --- | --- |
| 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) |  |

|  |  |
| --- | --- |
| 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) |  |

|  |  |
| --- | --- |
| 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**

|  |  |
| --- | --- |
| 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?  These results are significantly different.  I think this different results from the Z\_PATIENT\_IMMUNIZATION TABLE. There were multiple patients who had multiple rows of data for the same immunization code and immunization date. The difference was the BASE\_COST – there was a record that showed BASE\_COST as (null), another row that showed BASE\_COST as 0, and finally a row that showed the actual BASE\_COST amount. In populating the Z\_PATIENT\_IMMUNIZATION table, we pulled in only the rows with the max(BASE\_COST). |

|  |  |
| --- | --- |
| 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 counts in these queries are significantly different, but the immunizations are the same. I believe the counts are so different because of the removal of duplicated immunization codes and dates with different base costs in the Z\_PATIENT\_IMMUNIZATION table. |

|  |  |
| --- | --- |
| 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 counts in these queries are significantly different, but the immunizations are the same. I believe the counts are so different because of the removal of duplicated immunization codes and dates with different base costs in the Z\_PATIENT\_IMMUNIZATION table. |

|  |  |
| --- | --- |
| 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 counts in these queries are significantly different, but the county is the same. I believe the counts are so different because of the removal of duplicated immunization codes and dates with different base costs in the Z\_PATIENT\_IMMUNIZATION table. |

|  |  |
| --- | --- |
| 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; |
| 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; |
| Z Result: |  |
| Comments | Any differences on the two results?  The counts in these queries are significantly different, but the immunizations and popularity of the immunizations are the same. I believe the counts are so different because of the removal of duplicated immunization codes and dates with different base costs in the Z\_PATIENT\_IMMUNIZATION table. |

|  |  |
| --- | --- |
| 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 counts in these queries are significantly different, but the immunizations and the percent changes from 2020 to 2019 are the same. I believe the counts are so different because of the removal of duplicated immunization codes and dates with different base costs in the Z\_PATIENT\_IMMUNIZATION table. |

|  |  |
| --- | --- |
| 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?  It is difficult to determine a peak season/month in 2020 as we only have data for half the year of 2020.  The counts in these queries are significantly different, but the most popular immunization months for Influenza in 2019 and 2020 are the same. I believe the counts are so different because of the removal of duplicated immunization codes and dates with different base costs in the Z\_PATIENT\_IMMUNIZATION table. |

|  |  |
| --- | --- |
| 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. |

|  |  |
| --- | --- |
| 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 identical. |

|  |  |
| --- | --- |
| 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. |

|  |  |
| --- | --- |
| 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**

|  |  |
| --- | --- |
| 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. |

|  |  |
| --- | --- |
| 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. |

|  |  |
| --- | --- |
| 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. |

|  |  |
| --- | --- |
| 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. |

|  |  |
| --- | --- |
| 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 slightly different. |

**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 c.PATIENT\_ID, b.IMMUNIZATION\_CODE, a.IMMUNIZATION\_DATE, MAX(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

GROUP BY c.PATIENT\_ID, b.IMMUNIZATION\_CODE, a.IMMUNIZATION\_DATE;

-- 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;

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;

-- 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;