

COMP421 Database System

Group Project 3

Question 1.

a. Previous price of vaccination

```
SELECT price, vname
FROM vaccination
ORDER BY vname asc;
```




	 vname character varying (255)	 price double precision	
1	COVID-19		29
2	COVID-19		50
3	COVID-19		68
4	MERS-CoV		7
5	MERS-CoV		7
6	MERS-CoV		18
7	MERS-CoV		18
8	MERS-CoV		73
9	MERS-CoV		400
10	SARS-CoV		10
11	SARS-CoV		10
12	SARS-CoV		15
13	SARS-CoV		15
14	SARS-CoV		20
15	SARS-CoV		27
16	SARS-CoV		120
17	Zika virus		20
18	Zika virus		20
19	Zika virus		23
20	Zika virus		28
21	Zika virus		35
22	Zika virus		57

Figure 1. Screenshot of before

- b. Use a stored procedure to update the price with respect to a given ratio for each vaccination of a certain virus according to the total patient number (aggregated count) infected with that virus.

Idea: more expensive with more people infected

```
create FUNCTION update_vaccination_price(base int)
returns void AS $$
declare
    curs1 cursor for select vname, count(*) as total from
infect
    group by vname;
    curs2 cursor for select vname, price from vaccination;
begin
    <<outerloop>>
    for r1 in curs1 LOOP
        <<innerloop>>
        for r2 in curs2 LOOP
            if r1.vname = r2.vname then
                update vaccination
                set price = (r1.total*1. / base*1.) * price + price
                where current of curs2;

            END IF;
        end loop innerloop;
    end loop outerloop;
end;
$$ language 'plpgsql'
```

- c. After update (base = 20)

```
SELECT v1.vname , price
FROM vaccination v1
left outer JOIN infect_count ON
v1.vname = infect_count.vname
ORDER BY vname ASC;
```

	vname character varying (255)	price double precision
1	COVID-19	46.4
2	COVID-19	80
3	COVID-19	108.8
4	MERS-CoV	9.45
5	MERS-CoV	9.45
6	MERS-CoV	24.3
7	MERS-CoV	24.3
8	MERS-CoV	98.55
9	MERS-CoV	540
10	SARS-CoV	12.5
11	SARS-CoV	12.5
12	SARS-CoV	18.75
13	SARS-CoV	18.75
14	SARS-CoV	25
15	SARS-CoV	33.75
16	SARS-CoV	150
17	Zika virus	30
18	Zika virus	30
19	Zika virus	34.5
20	Zika virus	42
21	Zika virus	52.5
22	Zika virus	85.5

Figure 2. Screenshot after update

Question 2.

The programme (Q2.java and Helpers.java) and a script showing the program running are in folder 'Q2'.

There are Six options in the main menu (one is Quit). By inputting the number before the name of the options, the user can enter the sub-menu and fulfil the requirements by following instructions.

0. Quit

1. Query : P (Virus | Symptom)

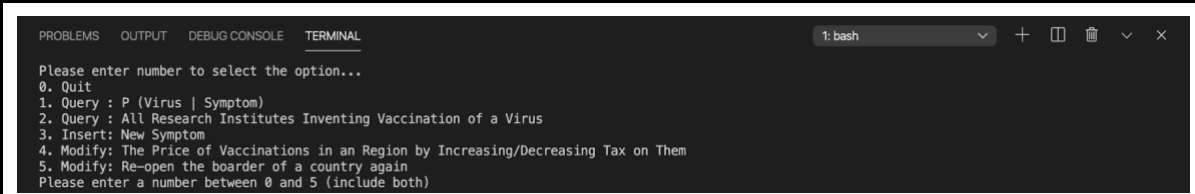
2. Query : All Research Institutes Inventing Vaccination of a Virus

3. Insert : New Symptom

4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them

5. Modify: Re-open the border of a country again

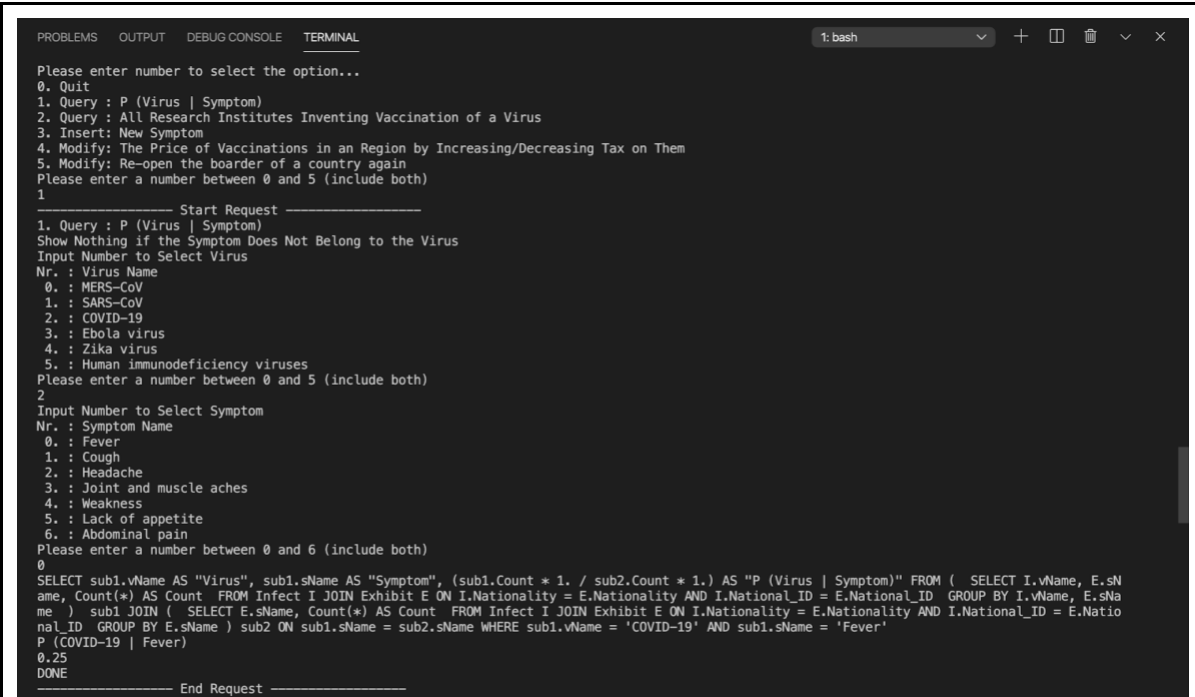
Below are screenshots of the programme executing every option



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
1: bash

Please enter number to select the option...
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
```

Main Menu



```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL
1: bash

Please enter number to select the option...
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
1
----- Start Request -----
1. Query : P (Virus | Symptom)
Show Nothing if the Symptom Does Not Belong to the Virus
Input Number to Select Virus
Nr. : Virus Name
0. : MERS-CoV
1. : SARS-CoV
2. : COVID-19
3. : Ebola virus
4. : Zika virus
5. : Human immunodeficiency viruses
Please enter a number between 0 and 5 (include both)
2
Input Number to Select Symptom
Nr. : Symptom Name
0. : Fever
1. : Cough
2. : Headache
3. : Joint and muscle aches
4. : Weakness
5. : Lack of appetite
6. : Abdominal pain
Please enter a number between 0 and 6 (include both)
0
SELECT sub1.vName AS "Virus", sub1.sName AS "Symptom", (sub1.Count * 1. / sub2.Count * 1.) AS "P (Virus | Symptom)" FROM ( SELECT I.vName, E.sName, Count(*) AS Count FROM Infect I JOIN Exhibit E ON I.Nationality = E.Nationality AND I.National_ID = E.National_ID GROUP BY I.vName, E.sName ) sub1 JOIN ( SELECT E.sName, Count(*) AS Count FROM Infect I JOIN Exhibit E ON I.Nationality = E.Nationality AND I.National_ID = E.National_ID GROUP BY E.sName ) sub2 ON sub1.sName = sub2.sName WHERE sub1.vName = 'COVID-19' AND sub1.sName = 'Fever'
0.25
DONE
----- End Request -----
```

Query - P(Virus | Symptom)

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1: bash
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
2
----- Start Request -----
2. Query : All Research Institutes Inventing Vaccination of a Virus
Input Number to Select Virus
Nr. : Virus Name
0. : MERS-CoV
1. : SARS-CoV
2. : COVID-19
3. : Ebola virus
4. : Zika virus
5. : Human immunodeficiency viruses
Please enter a number between 0 and 5 (include both)
2
SELECT V.iName AS "Research Institute", V.rName AS "Country", R.address AS "Address" FROM Vaccination AS V JOIN Research_Institute AS R ON V.rName = R.rName AND V.iName = R.iName WHERE V.vName = 'COVID-19'
Research Institute : The University of Tokyo
Country : Japan
Address : Bunkyo City

Research Institute : Columbia University Irving Medical Center
Country : United States
Address : 622 W 168th St, New York, NY 10032, Vereinigte Staaten

Research Institute : The University of Texas Southwestern Medical Center
Country : United States
Address : 5323 Harry Hines Blvd., Dallas, Texas 75390

DONE
----- End Request -----
```

Query - List Inventers of a Vaccination

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1: bash
Please enter number to select the option...
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
3
----- Start Request -----
3. Insert: New Symptom
Please Enter the Name of a new Symptom
Please enter a String shorter than 250 (Only numbers, alphabets and whitespace are allowed)
Vincent
Please Enter the Description of a new Symptom
Please enter a String shorter than 990 (Only numbers, alphabets and whitespace are allowed)
Happy
INSERT INTO Symptom(sname, description) VALUES ( 'Vincent' , 'Happy' )
DONE
----- End Request -----
```

Insert - New Symptom

```
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL 1: bash
----- End Request -----
Please enter number to select the option...
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
4
----- Start Request -----
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
Input Number to Select Region
Nr. : Region Name
0. : United States
1. : China
2. : Iran
3. : Nigeria
4. : Brazil
5. : Germany
6. : Taiwan
7. : Japan
8. : UK
9. : Canada
10. : India
11. : France
Please enter a number between 0 and 11 (include both)
8
Please Enter the Percentage to Change. e.g. -30 will decrease the Price of vaccinations by 30%
Please enter a number between -200 and 200 (include both)
5
UPDATE vaccination SET price = price * 0.05 where rname = 'UK'
DONE
----- End Request -----
```

Modify - Change the Price of Vaccinations

```
Please enter number to select the option...
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
5
----- Start Request -----
5. Modify: Re-open the boarder of a country again
Input Number to Select Region
Nr. : Region Name
0. : United States
1. : China
2. : Iran
3. : Nigeria
4. : Brazil
5. : Germany
6. : Taiwan
7. : Japan
8. : UK
9. : Canada
10. : India
11. : France
Please enter a number between 0 and 11 (include both)
7
UPDATE closed_border SET End_Time = '2020-04-11' where r1rname = 'Japan'
DONE
----- End Request -----
```

Modify - Open Boarder

```
Please enter number to select the option...
0. Quit
1. Query : P (Virus | Symptom)
2. Query : All Research Institutes Inventing Vaccination of a Virus
3. Insert: New Symptom
4. Modify: The Price of Vaccinations in an Region by Increasing/Decreasing Tax on Them
5. Modify: Re-open the boarder of a country again
Please enter a number between 0 and 5 (include both)
0
----- Bye! -----
```

Quit

Question 3.

1. CREATE INDEX idx_end_time ON Closed_Border (End_Time);

When the situation of virus is under controlled in some region, it's border will probably be opened. The end time of closing border can reflect the control process of the virus. The index idx_end_time can improve the query performance when the query has constraints about End_Time.

To get the top five date when most borders were reopened:

```
SELECT C.End_Time, COUNT(*) AS Count
FROM Closed_Border C
GROUP BY C.End_Time
ORDER BY Count DESC
LIMIT 5;
```

By maintaining a sorted order of End_Time, the above query would execute quicker.

2. CREATE INDEX idx_price ON Vaccination (Currency, Price);

When epidemics or pandemics outbreaks, many institutions will do research and development of the vaccine. The price of vaccine will affect people's choice of vaccine. To get the rName, iName, Code, Currency, Price of the cheapest index for each currency, the following query will be used.

```
SELECT Va.rName, Va.iName, Va.Code, Va.Currency, Va.Price
FROM Vaccination Va JOIN
(
    SELECT V.Currency, MIN (V.Price) AS minPrice
    FROM Vaccination V
    GROUP BY V.Currency
)
WHERE Va.Currency = V.currency AND Va.Price = minPrice;
```

By maintaining a sorted order of (Currency, Price), the above query would execute quicker.

Question 4.

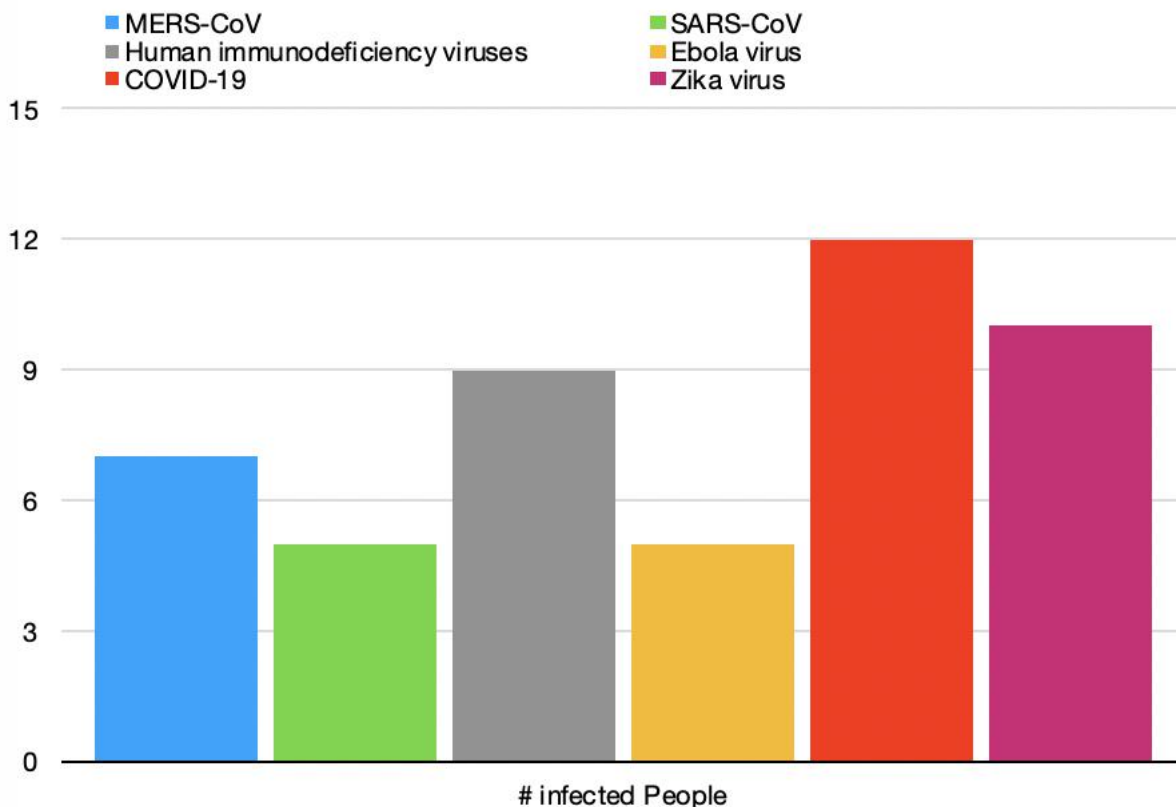


Figure 3. The number of infected people per virus

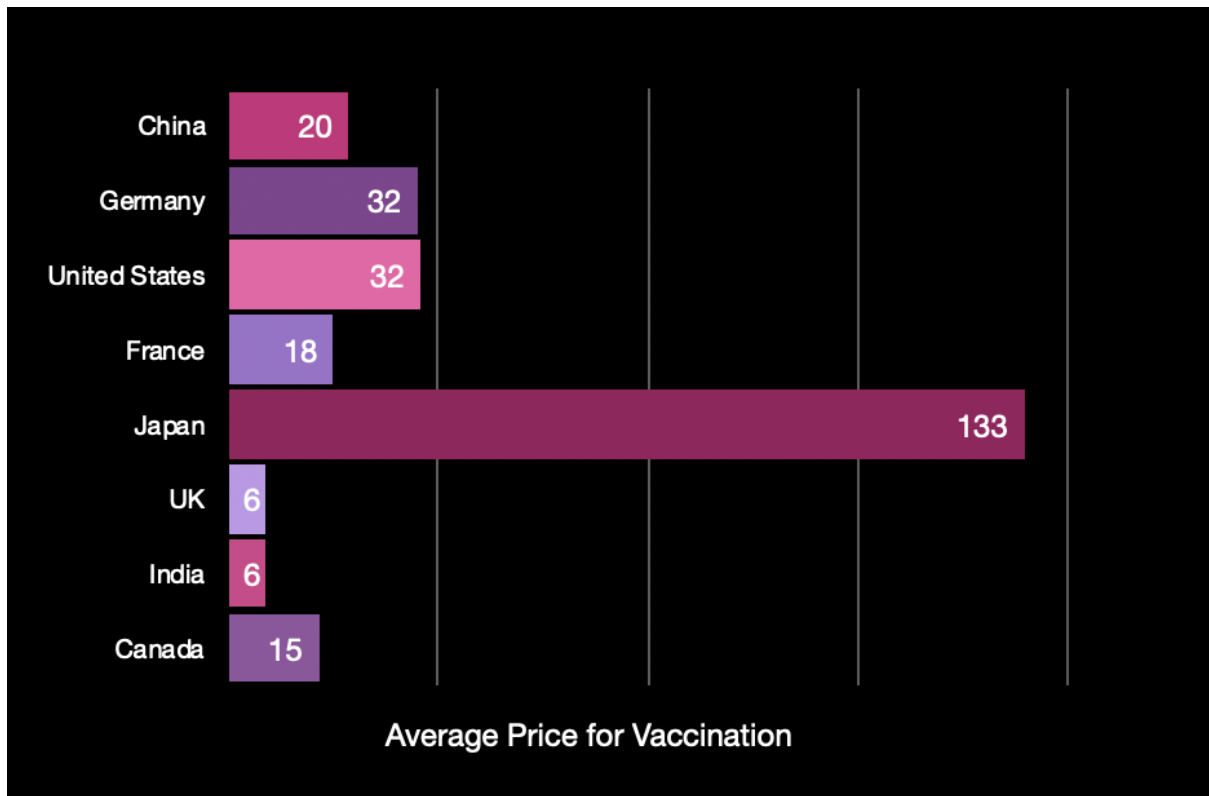


Figure 4. The average price for vaccination for different countries

The (i) SQL used to generate the data, (ii) The Excel / Google spreadsheet you did the work on are in the folder Q4

Question 5.

SQL Stored Procedure
<pre> CREATE OR REPLACE FUNCTION hospital_analysis(virusNm VARCHAR, hosNm VARCHAR, OUT total_patient INT, OUT recovered_p INT, OUT avg_time_month REAL, OUT not_recovered_P INT) AS \$\$ DECLARE rec RECORD; ctrnotHeal INT := 0; ctrAll INT := 0; ctrHeal INT := 0; avg_time REAL:= 0.; cursor1 CURSOR(virusNm VARCHAR, hosNm VARCHAR) FOR SELECT acc.begin_time AS bt, acc.end_time AS et FROM accommodation acc, infect i WHERE i.vname = virusNm AND i.nationality = acc.nationality AND i.national_id = acc.national_id AND acc.iname = hosNm; BEGIN OPEN cursor1(virusNm, hosNm); </pre>


```

LOOP
FETCH cursor1 INTO rec;
EXIT WHEN NOT FOUND;
IF rec.et IS NULL THEN
    ctrnotHeal := ctrnotHeal + 1;
END IF;
IF rec.et IS NOT NULL THEN
    ctrHeal := ctrHeal + 1;
    avg_time := avg_time + (DATE_PART('year', rec.et::date) -
        DATE_PART('year', rec.bt::date)) * 12 +
        (DATE_PART('month', rec.et::date) -
        DATE_PART('month', rec.bt::date));
END IF;
ctrAll := ctrAll + 1;
END LOOP;
CLOSE cursor1;
IF ctrHeal <> 0 THEN
    avg_time := (avg_time * 1.0) / (ctrAll * 1.0);
END IF;
total_patient := ctrAll;
recovered_p := ctrHeal;
avg_time_month := avg_time;
not_recovered_P := ctrnotHeal;
END;
$$ LANGUAGE 'plpgsql';

```

Output	Running Query
hospital_analysis record <hr/> (23,11,1.43478,11)	SELECT hospital_analysis('COVID-19', 'Winsen Hospital Germany');
hospital_analysis record <hr/> (18,13,2.16667,13)	SELECT hospital_analysis('SARS-CoV', 'Winsen Hospital Germany');
hospital_analysis record <hr/> (1,1,16,1)	SELECT hospital_analysis('COVID-19', 'Florida Hospital Orlando');
hospital_analysis record <hr/> (9,2,3.88889,2)	SELECT hospital_analysis('COVID-19', 'Ruijin Hospital');