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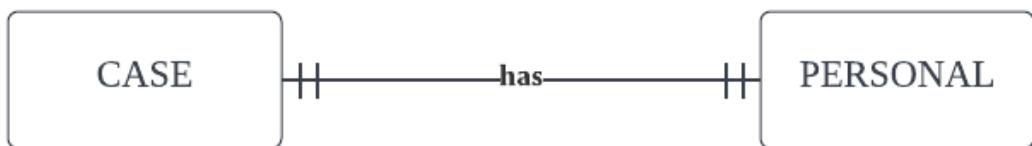
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1. Introduction

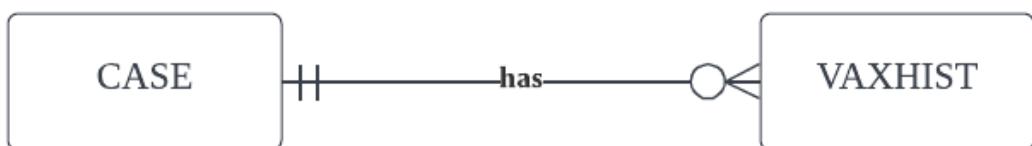
This report aims to track COVID-19 cases in Hong Kong using big data. The community and imported transmission tracking, the patient characteristics, and the service demand of the healthcare system are the major fields of our study in this database management system. The collected data will be used for building the relationship between different tables while the queries will analyze the collected data in the chart after the calculation and further generate reports to display the relationship between the collected data. These relevant reports will help analyze the trend of the epidemic in Hong Kong in the next fourteen days.

2. Describe the business rules

A CASE has one PERSONAL information, each PERSONAL information belongs to one CASE only.



A CASE can have none or many VAXHIST, each VAXHIST belongs to one CASE only.



A VAX can be injected by many VAXHIST, each VAXHIST injects one VAX only.



A CASE can have none or one INPUT, each INPUT is belonged to one CASE only.



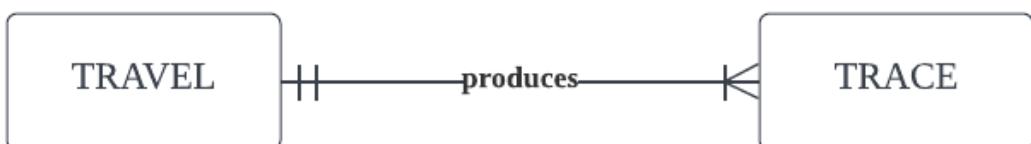
A CASE can have none or many TRAVEL, each TRAVEL belongs to one CASE only.



A CASE can live in none or one BUILDING, each BUILDING can belong to many CASE.



A TRAVEL produce many TRACE, each TRACE is produced by one TRAVEL only.



A TRACE can use none or one TRANSPORT, each TRANSPORT can be used by many TRACE.



A TRACE can have none or one VISIT, each VISIT belongs to one TRACE only.



A VISIT belongs to one BUILDING, each BUILDING can be visited by none or many VISIT.



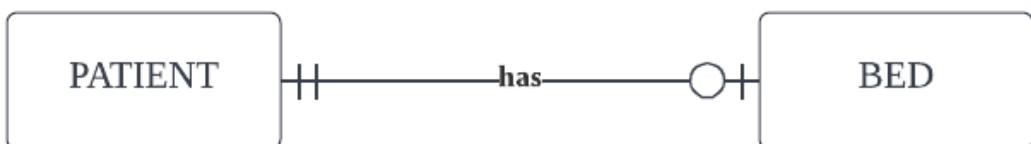
A CASE can have none or many ENROLL, each ENROLL belongs to one CASE only.



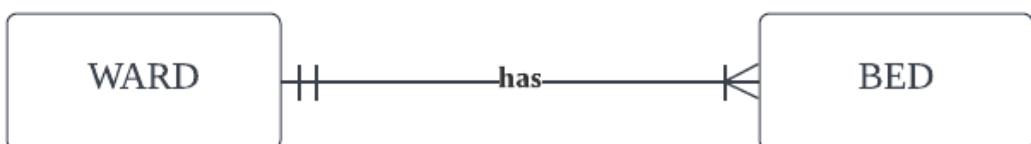
An ENROLL admits one PATIENT, each PATIENT is admitted by one ENROLL only.



A PATIENT can have none or many BED, each BED belongs to one PATIENT only.



A WARD can have many BED, each BED belongs to one WARD only.



A HOSPITAL can have many WARD, each WARD belongs to one HOSPITAL only.



A HOSPITAL belongs to one BUILDING, each BUILDING can be used to none or one HOSPITAL only.



3. Data dictionary

CASE (CASE_NO, CASE_COVID, CASE_RPTDT, CASE_COND, CASE_UPDT)
PERSONAL (PER_ID, CASE_NO, PER_LN, PER_FN, PER_AGE, PER_GN, PER_NATL,
PER_JOB, PER_HOME)

INPUT (IN_ID, CASE_NO, IN_CTRY, IN_TRANS, IN_SERIES, IN_SEATNO)

VAXHIST (HIST_ID, CASE_NO, VAX_NAME, HIST_DT, HIST_DOSE)
VAX (VAX_NAME, VAX_BRAND, VAX_PLFT)

TRAVEL (TRC_ID, CASE_NO)

TRACE (TRC_ID, TRAN_RTE, TRC_SP, TRC_DESTIN, TRC_DT)

TRANSPORT (TRAN_RTE, TRAN_TYPE)

VISIT (VIS_ID, BLDG_NAME, TRC_ID, VIS_DUR, VIS_DT)

BUILDING (BLDG_NAME, BLDG_TYPE, BLDG_SIT, BLDG_ADDR)

ENROLL (PT_NO, CASE_NO)

PATIENT (PT_NO, HOSP_NAME, BED_NO, WARD_NO, PT_ADMDT, PT_DISCHDT)

BED (BED_NO, WARD_NO)

WARD (WARD_NO, HOSP_NAME)

HOSPITAL (HOSP_NAME, HOSP_TYPE)

LOGIN (ID, PW, USER_GP)

4. Data format

CASE

Field	Data type	PK/FK	Description
CASE_NO	Short Text	PK	Case number
CASE_COVID	Short Text		Covid variant of cases
CASE_RPTDT	Date/Time		Report date of positive confirmation
CASE_COND	Short Text		Patient's latest condition (Hospitalized, Critical, Discharged, Deceased)
CASE_UPDT	Date/Time		Report date of latest condition
Details	This table records all the covid cases, including positive information and patient's latest condition, allows researcher to deduct latest pandemic situation and medical pressure.		
Public	Access all field		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

PERSONAL

Field	Data type	PK/FK	Description
PER_ID	Short Text	PK+FK	Personal number
CASE_NO	Short Text	PK+FK	Case number
PER_LN	Short Text		Last name
PER_FN	Short Text		First name
PER_AGE	Number		Age
PER_GN	Short Text		Gender
PER_NATL	Short Text		Nationality
PER_JOB	Short Text		Job
PER_HOME	Short Text	FK	Home address (Records building name only)

Details	This table records all the personal information to allow researcher to analyse the characteristics of patients by comparing with patient's condition. Researcher can also find out number of cases in an estate to decide estate's lockdown. Public can access confirmed building list to avoid visiting and gathering.
Public	Access PER_AGE, PER_NATL, PER_JOB with case number Access anonyms PER_HOME building list
Staff	Access and modify all field
Researcher	Access all field
Admin	Access and modify all field

INPUT

Field	Data type	PK/FK	Description
IN_ID	Short Text	PK+FK	Input ID
CASE_NO	Short Text	PK+FK	Case number
IN_CTRY	Short Text		Input country
IN_TRANS	Short Text		Input transport
IN_SERIES	Short Text		Input series number
IN_SEATNO	Short Text		Input seat number
Details	This table records the travel information of input cases, allow researcher and public to track the input record, like which flight carries positive cases to decide isolation.		
Public	Access all fields excepts IN_ID		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

VAX_HIST

Field	Data type	PK/FK	Description
HIST_ID	Short Text	PK	History ID
CASE_NO	Short Text	FK	Case number
VAX_NAME	Short Text	FK	Vaccine name
HIST_DT	Date/Time		History date

HIST_DOSE	Short Text		History dose number
Details	This table records vaccine history of cases, so that researcher can deduce which vaccine and dosage is the most effective. Public can access this field for education purpose.		
Public	All fields excepts HIST_ID		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

VAX

Field	Data type	PK/FK	Description
VAX_NAME	Short Text	PK	Vaccine name
VAX_BRAND	Short Text		Vaccine brand
VAX_PLFT	Short Text		Vaccine technology platform
Details	This table records covid vaccine available in worldwide, the VAX_NAME will be used VAX_HIST		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

TRAVEL

Field	Data type	PK/FK	Description
CASE_NO	Short Text	PK+FK	Case number
TRC_ID	Short Text	PK+FK	Trace ID
Details	This table is a composite entity between CASE and TRACE		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

TRACE

Field	Data type	PK/FK	Description
TRC_ID	Short Text	PK	Trace ID
TRC_SP	Short Text		Trace start point
TRC_DESTIN	Short Text		Trace destination
TRC_DT	Date/Time		Trace date
TRAN_TYPE	Short Text		Transportation type
TRAN_RTE	Short Text		Transportation route
Details	This table records the transport information in each trace, researcher can find the date, destination and transportation route used by the patients.		
Public	All fields excepts TRC_ID		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

TRANSPORT

Field	Data type	PK/FK	Description
TRAN_RTE	Short Text	PK	Transportation route
TRAN_TYPE	Short Text		Transportation type
Details	This table records the public transportation route in Hong Kong, the TRAN_RTE will be used by TRACE.		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

VISIT

Field	Data type	PK/FK	Description
VIS_ID	Short Text	PK+FK	Visit ID
BLDG_NAME	Short Text	PK+FK	Building name
TRC_ID	Short Text	PK+FK	Trace ID
VIS_DUR	Short Text		Visit duration

VIS_DT	Date/Time		Visit date
Details	This table records visits building of by the patients. The researcher may base on visit duration to decide a compulsory testing. Public should avoid visiting the building in visits building list.		
Public	Access all field except VIS_ID		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

BUILDING

Field	Data type	PK/FK	Description
BLDG_NAME	Short Text	PK	Building name
BLDG_TYPE	Short Text		Building type
BLDG_DIST	Short Text		Building district
BLDG_ADDR	Short Text		Building address
Details	This table records the buildings name, address and its function in Hong Kong. BLDG_NAME will be used in PERSONAL, VISIT and HOSPITAL.		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

ENROLL

Field	Data type	PK/FK	Description
CASE_NO	Short Text	PK+FK	Case number
PT_NO	Short Text	PK+FK	Patient number
Details	This table is a composite entity between CASE and PATIENT		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

PATIENT

Field	Data type	PK/FK	Description
PT_NO	Short Text	PK	Patient number
BED_NO	Short Text	FK	Bed number
Details	This table records patient's bed number during hospitalization for staff to reference.		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

BED

Field	Data type	PK/FK	Description
BED_NO	Short Text	PK	Bed number
WARD_NO	Short Text	FK	Ward number
Details	This table records all the bed number in a ward, researcher can count the medical system pressure by bed number and patient's condition.		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

WARD

Field	Data type	PK/FK	Description
WARD_NO	Short Text	PK	Ward number
HOSP_NAME	Short Text	FK	Hospital name
Details	This table records all the wards in each hospital.		
Public	No access		
Staff	Access and modify all field		
Researcher	Access all field		

Admin	Access and modify all field
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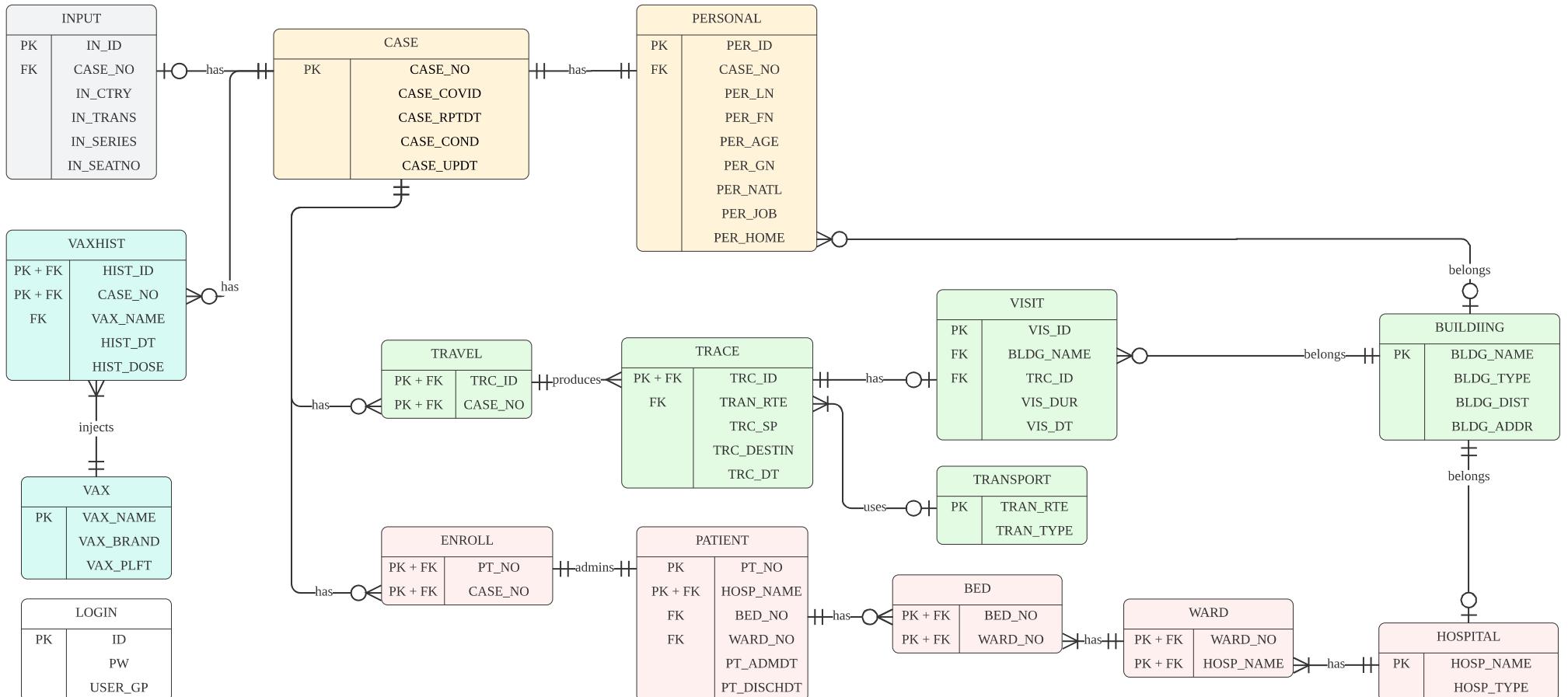
HOSPITAL

Field	Data type	PK/FK	Description
HOSP_NAME	Short Text	PK+FK	Hospital name
HOSP_TYPE	Short Text		Hospital type (Public Hospital, Private Hospital, Community Isolation Facility)
Details	This table records all the hospitals in Hong Kong.		
Public	Access anonyms hospital bed usage		
Staff	Access and modify all field		
Researcher	Access all field		
Admin	Access and modify all field		

LOGIN

Field	Data type	PK/FK	Description
ID	Short Text	PK	User ID
PW	Short Text		User password
USER_GP	Short Text		User group
Details	This table records all the government system login information		
Public	No access		
Staff	No access		
Researcher	No access		
Admin	Access and modify all field		

5. Conceptual model (ERD)



6. Logical design

(a) Queries design

Query name:

(Form) (General) Past pandemic situation

SQL code:

```
SELECT i.DT, i.TOTAL, i.INPUT, Nz([j.INJECTED],"0") AS INJECTED,  
i.DISCHARGED, i.DECEASED  
FROM (SELECT g.DT, g.TOTAL, Nz([h.INPUT],"0") AS [INPUT], g.DISCHARGED,  
g.DECEASED  
FROM (SELECT e.DT, e.TOTAL, e.DISCHARGED, Nz([f.DECEASED],"0") AS  
DECEASED  
FROM(SELECT c.DT, c.TOTAL, Nz([d.DISCHARGED],"0") AS DISCHARGED  
FROM (SELECT a.DT, Nz([b.TOTAL],"0") AS TOTAL  
FROM (SELECT DT FROM (SELECT CASE.CASE_RPTDT AS DT FROM CASE  
UNION SELECT CASE.CASE_UPDT FROM CASE  
UNION SELECT HIST_DT FROM VAX_HIST) ORDER BY DT) AS a  
  
LEFT JOIN  
(SELECT CASE.CASE_RPTDT AS RPTDT, COUNT(CASE.CASE_NO) AS TOTAL  
FROM CASE  
GROUP BY CASE.CASE_RPTDT) AS b  
ON a.DT = b.RPTDT) AS c  
  
LEFT JOIN  
(SELECT CASE.CASE_UPDT AS UPDT, COUNT(CASE.CASE_NO) AS  
DISCHARGED  
FROM CASE  
WHERE CASE.CASE_COND="Discharged"  
GROUP BY CASE.CASE_UPDT) AS d  
ON c.DT = d.UPDT) AS e  
  
LEFT JOIN
```

```
(SELECT CASE.CASE_UPDT AS UPDT, COUNT(CASE.CASE_NO) AS DECEASED  
FROM CASE  
WHERE CASE.CASE_COND="Deceased"  
GROUP BY CASE.CASE_UPDT) AS f  
ON e.DT = f.UPDT) AS g
```

LEFT JOIN

```
(SELECT CASE.CASE_RPTDT AS RPTDT, Count(INPUT.CASE_NO) AS INPUT  
FROM CASE, INPUT  
WHERE CASE.CASE_NO=INPUT.CASE_NO  
GROUP BY CASE.CASE_RPTDT) AS h  
ON g.DT = h.RPTDT) AS i
```

LEFT JOIN

```
(SELECT HIST_DT, COUNT(HIST_ID) AS INJECTED  
FROM VAX_HIST  
GROUP BY HIST_DT) AS j  
On i.DT = j.HIST_DT
```

Explanation:

This query uses UNION to join HIST_DT, CASE_RPT and CASE_UPDT into a single “DT” column. It then reorders the columns with ORDER BY. After that, it uses LEFT JOIN with 5 subqueries to calculate the number of cases, the input cases, the discharged cases, and the deceased cases on a specific date, respectively. Finally, it uses Nz function to change all null values into 0.

Screenshot:

	DT	TOTAL	INPUT	INJECTED	DISCHARGED	DECEASED
	8/15/2021	0	1	0	0	
	9/15/2021	0	1	0	0	
	10/15/2021	0	1	0	0	
	12/5/2021	0	1	0	0	
	12/14/2021	1	0	0	0	
	12/15/2021	1	0	0	0	
	12/16/2021	0	1	0	0	
	12/18/2021	0	1	0	0	
	12/21/2021	0	1	0	0	
	12/23/2021	1	0	0	0	
	1/1/2022	0	3	0	0	
	1/2/2022	0	12	0	0	
	1/3/2022	0	2	0	0	
	1/5/2022	0	1	0	0	
	1/14/2022	1	0	0	0	
	1/18/2022	0	1	0	0	
	1/20/2022	1	0	0	0	
	2/1/2022	0	3	0	0	
	2/2/2022	1	5	0	0	
	2/3/2022	0	1	0	0	
	2/5/2022	1	0	0	0	
	2/10/2022	1	0	0	0	
	2/16/2022	1	0	0	0	
	2/18/2022	1	0	0	0	
	2/21/2022	1	0	0	0	

Query name:

(Report) (General) Case by age group

SQL code:

```

SELECT "0-10" AS AGE_GROUP, [0-10] AS FREQUENCY FROM (SELECT
COUNT(*) AS [0-10] FROM CASE, PERSONAL WHERE CASE.CASE_NO =
PERSONAL.CASE_NO AND PER_AGE >= 0 AND PER_AGE < 10)
UNION
SELECT "10-20" AS AGE_GROUP, [10-20] AS FREQUENCY FROM (SELECT
COUNT(*) AS [10-20] FROM CASE, PERSONAL WHERE CASE.CASE_NO =
PERSONAL.CASE_NO AND PER_AGE >= 10 AND PER_AGE < 20)
UNION

```

```
SELECT "20-30" AS AGE_GROUP, [20-30] AS FREQUENCY FROM (SELECT  
COUNT(*) AS [20-30] FROM CASE, PERSONAL WHERE CASE.CASE_NO =  
PERSONAL.CASE_NO AND PER_AGE >= 20 AND PER_AGE < 30)  
UNION  
SELECT "30-40" AS AGE_GROUP, [30-40] AS FREQUENCY FROM (SELECT  
COUNT(*) AS [30-40] FROM CASE, PERSONAL WHERE CASE.CASE_NO =  
PERSONAL.CASE_NO AND PER_AGE >= 30 AND PER_AGE < 40)  
UNION  
SELECT "40-50" AS AGE_GROUP, [40-50] AS FREQUENCY FROM (SELECT  
COUNT(*) AS [40-50] FROM CASE, PERSONAL WHERE CASE.CASE_NO =  
PERSONAL.CASE_NO AND PER_AGE >= 40 AND PER_AGE < 50)  
UNION  
SELECT "50-60" AS AGE_GROUP, [50-60] AS FREQUENCY FROM (SELECT  
COUNT(*) AS [50-60] FROM CASE, PERSONAL WHERE CASE.CASE_NO =  
PERSONAL.CASE_NO AND PER_AGE >= 50 AND PER_AGE < 60)  
UNION SELECT "70+" AS AGE_GROUP, [70+] AS FREQUENCY FROM (SELECT  
COUNT(*) AS [70+] FROM CASE, PERSONAL WHERE CASE.CASE_NO =  
PERSONAL.CASE_NO AND PER_AGE >= 70);
```

Explanation:

This query first joins CASE and PERSONAL together. It then counts the frequency of age group by calculating PER_AGE separately and uses a subquery to rename the field. It then combines all seven queries by UNION.

Screenshot:

(Report) (General) Case by age group

AGE_GROUP	FREQUENCY
0-10	1
10-20	10
20-30	8
30-40	7
40-50	4
50-60	2
70+	5

Query name:

(Report) (Hospital) Bed usage by hospitals

SQL code:

```

SELECT b.HOSP_NAME AS HOSPITAL, ROUND(a.USED_BED/b.SUM_BED, 2) AS
USAGE
FROM
(SELECT COUNT(BED.BED_NO) AS USED_BED
FROM WARD, BED, PATIENT, ENROLL, [CASE]
WHERE WARD.WARD_NO = BED.WARD_NO
AND BED.BED_NO = PATIENT.BED_NO
AND PATIENT.PT_NO = ENROLL.PT_NO
AND ENROLL.CASE_NO = CASE.CASE_NO
AND (CASE_COND = "Hospitalized" OR CASE_COND = "Critical")
AND WARD.HOSP_NAME = "United Christian Hospital") AS a,
(SELECT COUNT(BED.BED_NO) AS SUM_BED, HOSPITAL.HOSP_NAME
FROM BED, WARD, HOSPITAL
WHERE BED.WARD_NO = WARD.WARD_NO
AND WARD.HOSP_NAME = HOSPITAL.HOSP_NAME
AND HOSPITAL.HOSP_NAME = "Queen Elizabeth Hospital"
GROUP BY HOSPITAL.HOSP_NAME) AS b
GROUP BY b.HOSP_NAME, a.USED_BED/b.SUM_BED

```

```

UNION
SELECT b.HOSP_NAME AS HOSPITAL, ROUND(a.USED_BED/b.SUM_BED, 2) AS
USAGE
FROM
(SELECT COUNT(BED.BED_NO) AS USED_BED
FROM WARD, BED, PATIENT, ENROLL, [CASE]
WHERE WARD.WARD_NO = BED.WARD_NO
AND BED.BED_NO = PATIENT.BED_NO
AND PATIENT.PT_NO = ENROLL.PT_NO
AND ENROLL.CASE_NO = CASE.CASE_NO
AND (CASE_COND = "Hospitalized" OR CASE_COND = "Critical")
AND WARD.HOSP_NAME = " Queen Elizabeth Hospita") AS a,
(SELECT COUNT(BED.BED_NO) AS SUM_BED, HOSPITAL.HOSP_NAME
UNION
-- Repeating groups for other hospitals .....

```

Explanation:

This query uses subquery to join WARD, BED, PATIENT, ENROLLMENT to count occupied beds in a hospital, it then uses another subquery to get sum of beds in that hospital. After that, it uses division from the result of two subquery to get the hospital usage. Finally, it uses UNION to join 9 different hospital fields together.

Screenshot:

HOSPITAL	USAGE
Caritas Medical Centre	0.45
Evangel Hospital	0.05
Fanling Community Isolation Facility	8.3333333333333E-02
Hong Kong Baptist Hospital	0.05
Kwong Wah Hospital	0.1
Penny's Bay Community Isolation Facility	8.3333333333333E-02
Precious Blood Hospital	0.05
Queen Elizabeth Hospital	0.15
United Christian Hospital	0.35

Query name:

(Report) (Vaccine) Death Rate by vaccine

SQL code:

```
SELECT a.VAX_NAME, ROUND(a.DEATH/b.TOTAL, 2) AS DEATH_RATE
FROM
(SELECT A.VAX_HIST.VAX_NAME, Count(*) AS DEATH FROM (SELECT
VAX_HIST.VAX_NAME, COUNT(CASE.CASE_NO) FROM [CASE]
INNER JOIN VAX_HIST ON CASE.CASE_NO = VAX_HIST.CASE_NO
WHERE CASE.CASE_COND="deceased"
GROUP BY VAX_HIST.VAX_NAME, CASE.CASE_NO) AS A GROUP BY
A.VAX_HIST.VAX_NAME) AS a,
(SELECT VAX_HIST.VAX_NAME, Count(*) AS TOTAL FROM (SELECT
VAX_HIST.VAX_NAME, COUNT(CASE.CASE_NO) FROM [CASE]
INNER JOIN VAX_HIST ON CASE.CASE_NO = VAX_HIST.CASE_NO
GROUP BY VAX_HIST.VAX_NAME, CASE.CASE_NO) AS B GROUP BY
B.VAX_HIST.VAX_NAME) AS b
WHERE a.VAX_NAME=b.VAX_NAME
GROUP BY a.VAX_NAME, a.DEATH, b.TOTAL;
```

Explanation:

This query calculates the overall death rate after being vaccinated and infected with the virus by using multiple sub-queries to combine them as one result.

Screenshot:

VAX_NAME	DEATH_RATE
BNT	0.2
CoronaVac	0.55

Query name:

(Form) (Input) Input record

SQL code:

```
SELECT INPUT.CASE_NO, INPUT.IN_CRTY, INPUT.IN_TRANS,
INPUT.IN_SERIES, INPUT.IN_SEATNO, CASE.CASE_COVID, CASE.CASE_RPTDT,
CASE.CASE_COND
FROM CASE INNER JOIN INPUT ON CASE.CASE_NO = INPUT.CASE_NO
```

```

GROUP BY INPUT.CASE_NO, INPUT.IN_CRTY, INPUT.IN_TRANS,
INPUT.IN_SERIES, INPUT.IN_SEATNO, CASE.CASE_COVID, CASE.CASE_RPTDT,
CASE.CASE_COND
ORDER BY INPUT.CASE_NO;

```

Explanation:

This query joins CASE and INPUT to select covid information and condition from CASE and transport information from INPUT and group them together.

Screenshot:

CASE_NO	IN_CRTY	IN_TRANS	IN_SERIES	IN_SEATNC	CASE_COVID	CASE_RPTDT	CASE_COND
0011	United States	Aeroplane	TK83	36	Delta	21-Feb-22	Deceased
0019	Japan	Aeroplane	CX6321	8	Omicron	02-Apr-22	Hospitalized
0026	Japan	Aeroplane	CX6321	12	Omicron	02-Apr-22	Hospitalized
0028	Japan	Aeroplane	CX6321	36	Omicron	03-Apr-22	Hospitalized
0034	Japan	Aeroplane	CX6321	66	Omicron	03-Apr-22	Critical
0035	Germany	Aeroplane	CX9202	4	Omicron	03-Apr-22	Hospitalized
0037	China	Shenzhen Bay Port			Omicron	03-Apr-22	Deceased
0038	China	Shenzhen Bay Port			Omicron	03-Apr-22	Deceased
0039	Singapore	Aeroplane	A350-900	20	Omicron	03-Apr-22	Hospitalized

Query name:

(Report) (Trace) MTR route visit list

SQL code:

```

SELECT TRC_DT, TRANSPORT.TRAN_RTE, COUNT(CASE.CASE_NO) AS
FREQUENCY
FROM [CASE], TRAVEL, TRACE, TRANSPORT
WHERE CASE.CASE_NO = TRAVEL.CASE_NO
AND TRAVEL.TRC_ID = TRACE.TRC_ID
AND TRACE.TRAN_RTE = TRANSPORT.TRAN_RTE
AND TRANSPORT.TRAN_TYPE = "MTR"
GROUP BY TRC_DT, TRANSPORT.TRAN_RTE;

```

Explanation:

This query joins CASE, TRAVEL, TRACE and TRANSPORT to count the times of visit routes by all the trace. It then groups the counting by date and route.

Screenshot:

(Report) (Trace) MTR route visit list

TRC_DT	TRAN_RTE	FREQUENCY
01-Dec-21	East Rail Line	2
01-Dec-21	Tuen Ma Line	2
13-Mar-22	Kwun Tong Line	1
13-Mar-22	Tsuen Wan Line	3

Query name:

(Report) (Trace) Transportation usage

SQL code:

```
SELECT a.TRAN_TYPE, ROUND(a.FREQUENCY/b.TOTAL_FREQUENCY, 2) AS [USAGE]
FROM
(SELECT TRACE.TRAN_TYPE, COUNT(TRACE.TRC_ID) AS FREQUENCY
FROM TRACE
GROUP BY TRACE.TRAN_TYPE) AS a,
(SELECT COUNT(TRACE.TRC_ID) AS TOTAL_FREQUENCY
FROM TRACE) AS b
GROUP BY a.TRAN_TYPE, a.FREQUENCY/b.TOTAL_FREQUENCY;
```

Explanation:

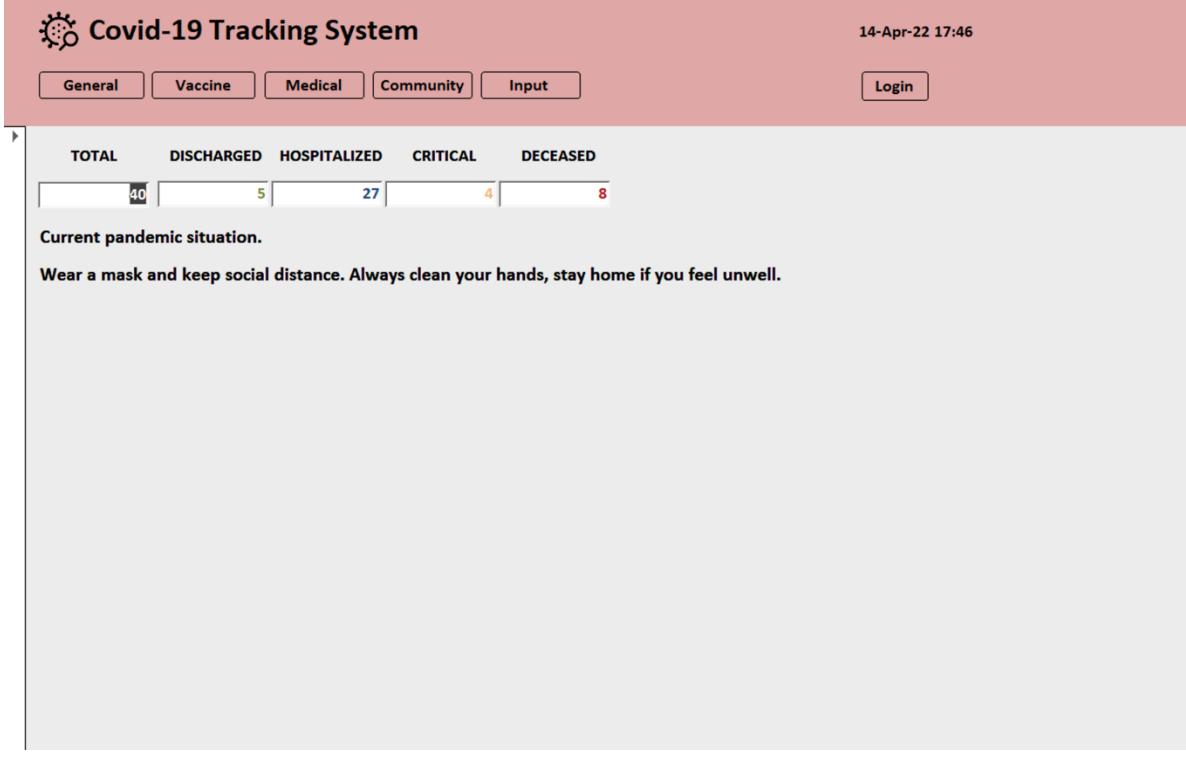
This query uses two subqueries. The first subquery counts the frequency of each transport type from trace. The second subquery counts the sum of frequencies from all transports. The outer query divides the frequency and the sum to get usage. It also uses the round function to fix the decimal.

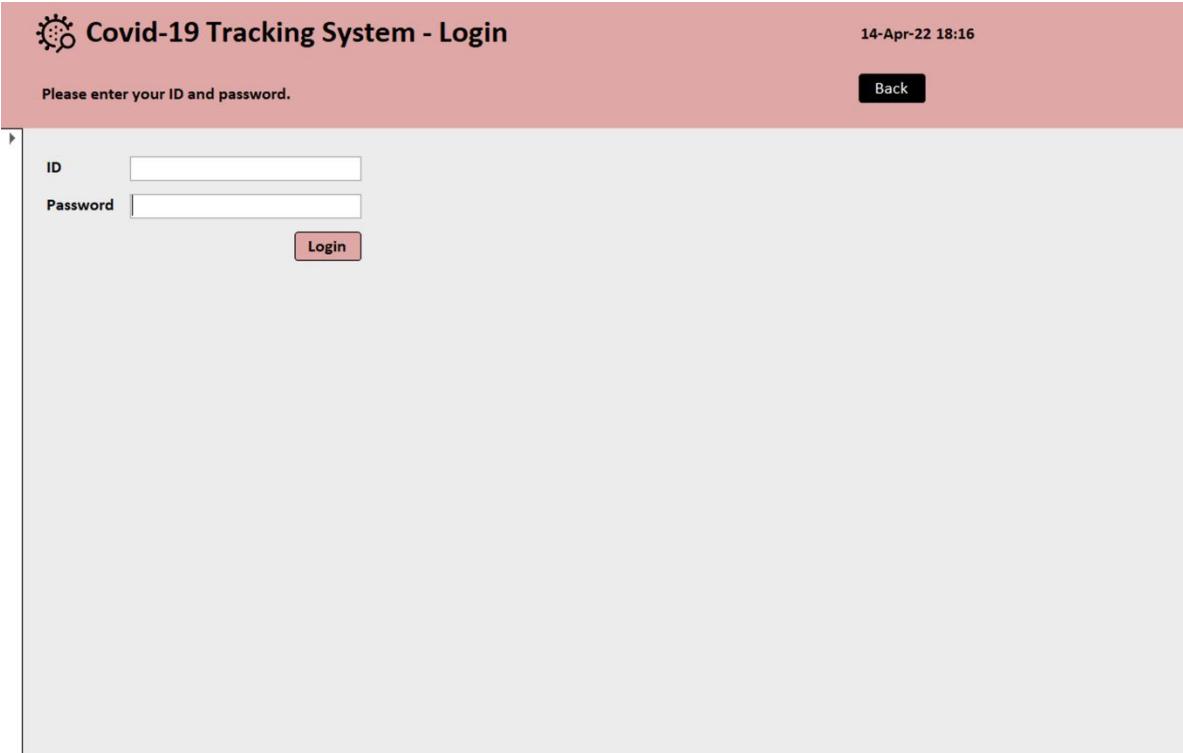
Screenshot:

(Report) (Trace) Transportation usage

TRAN_TYPE	USAGE
Drive	0.32
On foot	0.36
Public transport	0.32

(b) Application (e.g., forms, reports)

Form name (Portal) Homepage										
Description With our home page, the public can see the total number of cases, discharges, critical cases, and death cases. There is a navigation bar in the header. The public can move to different pages with button. (e.g., General, Vaccine, Medical, Community and Input). In the upper right corner, the public can see the current time, click the login button, and jump to the login page.										
Screenshot  <p>The screenshot shows the homepage of the Covid-19 Tracking System. At the top, there is a navigation bar with links for General, Vaccine, Medical, Community, and Input. On the right side of the navigation bar is a 'Login' button. The date and time '14-Apr-22 17:46' are displayed in the top right corner. Below the navigation bar, there is a summary table with the following data:</p> <table border="1"><thead><tr><th>TOTAL</th><th>DISCHARGED</th><th>HOSPITALIZED</th><th>CRITICAL</th><th>DECEASED</th></tr></thead><tbody><tr><td>40</td><td>5</td><td>27</td><td>4</td><td>8</td></tr></tbody></table> <p>Below the table, there is a message: 'Current pandemic situation. Wear a mask and keep social distance. Always clean your hands, stay home if you feel unwell.'</p>	TOTAL	DISCHARGED	HOSPITALIZED	CRITICAL	DECEASED	40	5	27	4	8
TOTAL	DISCHARGED	HOSPITALIZED	CRITICAL	DECEASED						
40	5	27	4	8						

Form name (Portal) Login page
Description Administrators, staff, researchers, and public can log into the system using their ID and password. In the upper right corner, the users can see the current time, click the back button to return to the home page.
Screenshot  <p>The screenshot shows a login interface for the "Covid-19 Tracking System". At the top, there's a red header bar with the title "Covid-19 Tracking System - Login" and the date "14-Apr-22 18:16". Below the header, a message says "Please enter your ID and password.". There are two input fields: one for "ID" and one for "Password", both with placeholder text. A "Login" button is located below the password field. A "Back" button is visible in the top right corner of the main content area.</p>

Form name
(Portal) (Gov) Staff page
Description
<p>Interface used by staff. When the staff need to add a new record to the VISIT table with a new building, they need to click the Case button to add new record to CASE_input form first. Second, click the Building button to add new record to BUILDING_input form. Third, click the Trace button to add new record to TRACE_input form. Finally, click the Visit button to add new record to VISIT_input form. The staff can view these forms. (e.g., Patient Personal Information and Hospitals with Cases). In the upper right corner, the public can click the back button to return to the home page.</p>
Screenshot

Form name

(Gov) Case input form

Description

A form for the staffs to input a new record in the CASE table. Click Add button to enter the record. Then, click the Save button to save the changes to the form.

Screenshot

CASE_input

CASE_NO	0041
CASE_COVID	Omicron
CASE_RPTDT	07-Apr-22
CASE_COND	Hospitalized
CASE_UPDT	12-Apr-22

 Add Save

Form name

(Gov) Building input form

Description

A form for the staffs to input a new record in the BUILDING table. Click Add button to enter the record. Then, click the Save button to save the changes to the form.

Screenshot

BUILDING_input

BLDG_NAME	Richland Gardens
BLDG_TYPE	Housing complete
BLDG_DIST	Kowloon
BLDG_ADDR	80 WANG KWONG ROAD, Kowloon Bay



Add Save

Form name

(Gov) Trace input form

Description

A form for the staffs to input a new record in the TRACE table. Click Add button to enter the record. Then, click the Save button to save the changes to the form.

Screenshot

TRACE_input

TRC_ID	0029	
TRC_SP	Kwong Wah Hospital	
TRC_DESTIN	Evangel Hospital	
TRC_DT	05-Apr-22	
TRAN_TYPE	Drive	
TRAN_RTE	<input type="button" value="▼"/>	

Form name

(Gov) Visit input form

Description

A form for the staff to input a new record in the VISIT table. Click Add button to enter the record. Then, click the Save button to save the changes to the form.

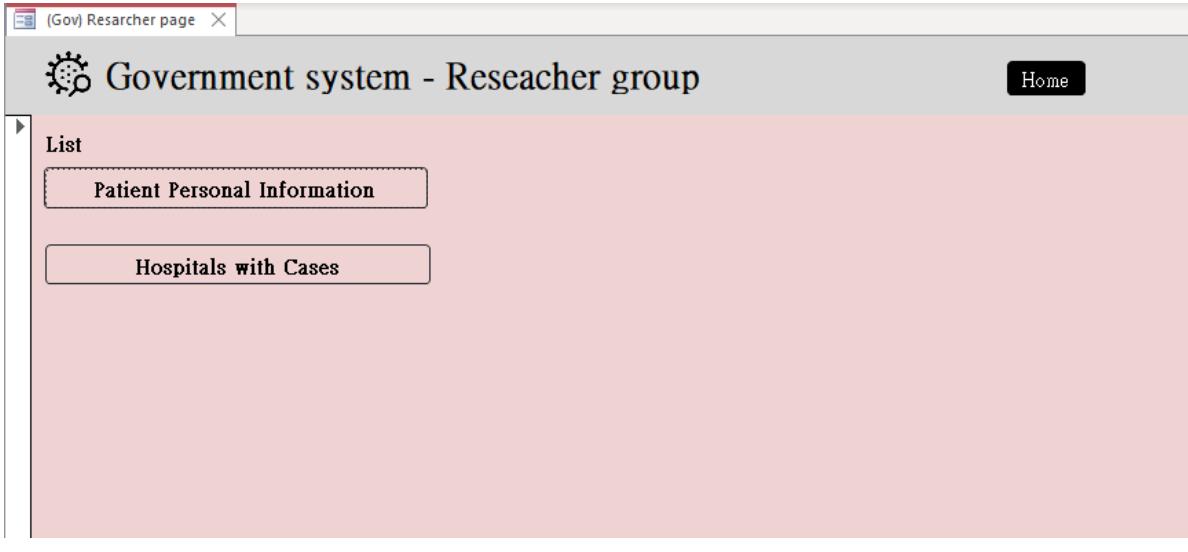
The BLDG_NAME in VISIT table must be the same to the BLDG_NAME in BUILDING table and TRC_ID in VISIT table must be the same to the TRC_ID in TRACE table.

Screenshot

VISIT_input

VIS_ID	0012
BLDG_NAME	Richland Gardens
TRC_ID	0029
VIS_DUR	3 hours
VIS_DT	5/4/2022

Add Save

Form name (Portal) (Gov) Researcher page
Description Interface used by researcher. The researcher can view these forms. (e.g., Patient Personal Information and Hospitals with Cases). In the upper right corner, the public can click the back button to return to the home page.
Screenshot  A screenshot of a web browser window titled '(Gov) Researcher page'. The main content area has a light blue header with the text 'Government system - Researcher group' and a 'Home' button. On the left, there is a vertical sidebar with a 'List' heading and two buttons: 'Patient Personal Information' and 'Hospitals with Cases'. The rest of the page is a large, empty pink rectangular area.

Form name

(Hospital) (Gov) Patients personal information

Description

The interface for user to view each patient's personal information independently. The users can click the previous, next, last, and close button to use this form. In the upper right corner, the user can click the close button to close the form.

Screenshot

The screenshot shows a medical system interface titled "Medical system - Patient's personal information". At the top right is a "Close" button. Below the title, there are seven input fields for personal information:

First name:	Kunde
Last name:	Chad
Age:	18
Gender:	M
Nation:	Hong Kong resident
Job:	Student
Home address:	Ho Man Tin Estate

At the bottom are four navigation buttons: a left arrow, a right arrow, a double-right arrow, and a red X button.

Form name

(Hospital) Patient records

Description

The interface for users to view the records of confirmed patients in each hospital. In the upper right corner, the user can click the close button to close the form.

Screenshot

Medical system - Hospital's patients record Close

Please select hospital from the list.

Hospital:

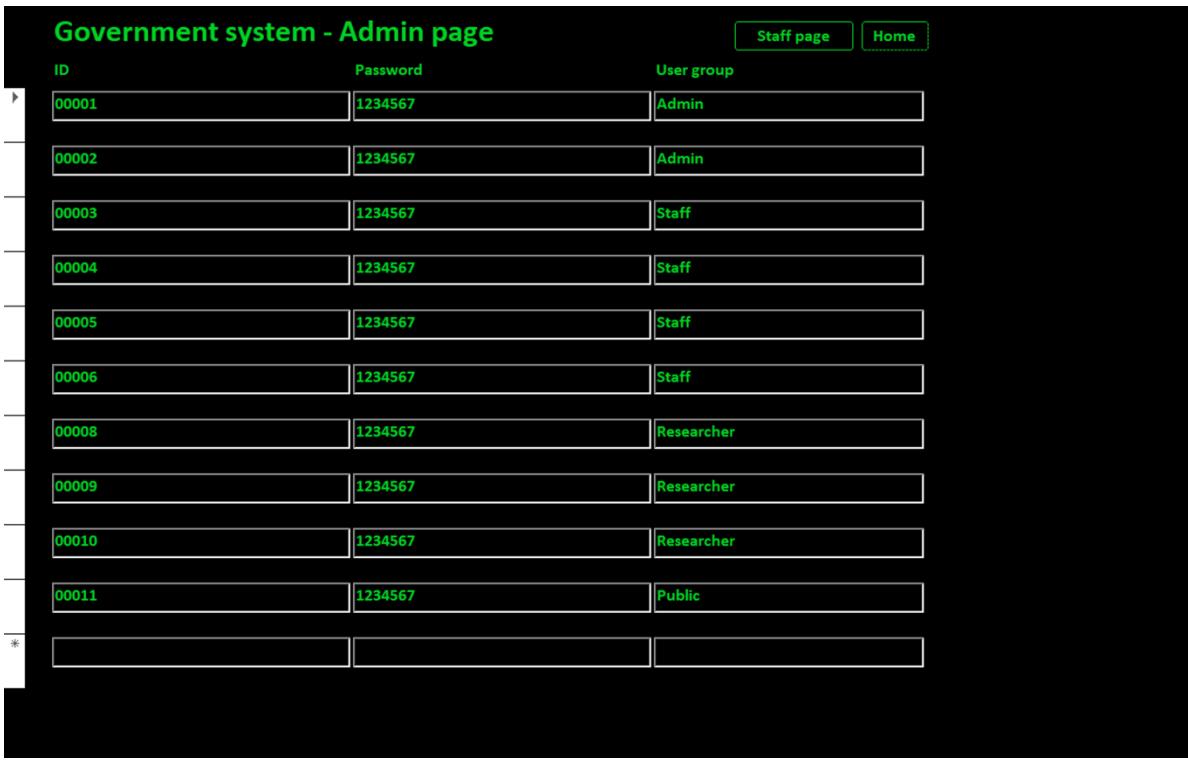
Hospital Type:

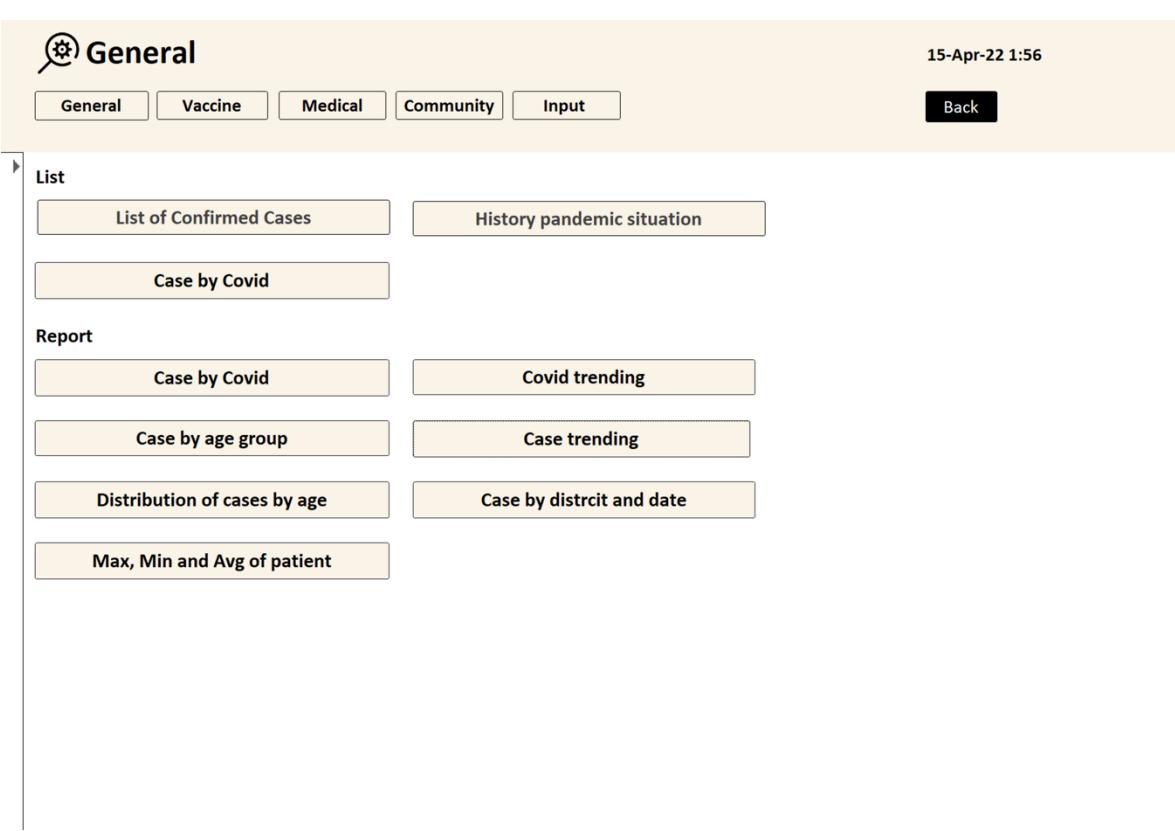
Patient:

PT_NO	BED_NO
C001	C01
C002	C02
C003	C03
C004	C04
C005	C05
C006	C06
C007	C07
C008	C08
C009	C09
C010	C10
*	

Record: 14 < 1 of 10 > >> No Filter Search

This screenshot shows a software interface titled 'Medical system - Hospital's patients record'. At the top right is a 'Close' button. Below it, a message says 'Please select hospital from the list.' A dropdown menu labeled 'Hospital:' contains the value 'Caritas Medical Centre'. Another input field labeled 'Hospital Type:' contains the value 'Public Hospital'. A section labeled 'Patient:' displays a grid of patient numbers (PT_NO) and their corresponding bed numbers (BED_NO). The grid has two columns: PT_NO and BED_NO. The PT_NO column lists entries from C001 to C010, with an asterisk (*) at the bottom. The BED_NO column lists entries from C01 to C10, with the first entry 'C01' highlighted in blue. At the bottom of the grid is a navigation bar with buttons for Record, Page Number, and search functions.

Form name																																				
(Portal) (Gov) Admin page																																				
Description																																				
Interface used by administrator. Administrators can view the IDs and passwords of all administrators, staff, researchers, and the public. In the upper right corner, the administrator can click the staff page and home button to return to the staff page and home page.																																				
Screenshot																																				
 <p>The screenshot shows a table titled "Government system - Admin page". The table has three columns: "ID", "Password", and "User group". There are 11 rows of data, each containing a unique ID (00001 to 00011), a password ("1234567" for most users, except for row 11 which is blank), and a user group (Admin, Staff, Researcher, or Public). At the top right of the table, there are two buttons: "Staff page" and "Home".</p> <table border="1"> <thead> <tr> <th>ID</th> <th>Password</th> <th>User group</th> </tr> </thead> <tbody> <tr> <td>00001</td> <td>1234567</td> <td>Admin</td> </tr> <tr> <td>00002</td> <td>1234567</td> <td>Admin</td> </tr> <tr> <td>00003</td> <td>1234567</td> <td>Staff</td> </tr> <tr> <td>00004</td> <td>1234567</td> <td>Staff</td> </tr> <tr> <td>00005</td> <td>1234567</td> <td>Staff</td> </tr> <tr> <td>00006</td> <td>1234567</td> <td>Staff</td> </tr> <tr> <td>00008</td> <td>1234567</td> <td>Researcher</td> </tr> <tr> <td>00009</td> <td>1234567</td> <td>Researcher</td> </tr> <tr> <td>00010</td> <td>1234567</td> <td>Researcher</td> </tr> <tr> <td>00011</td> <td></td> <td>Public</td> </tr> <tr> <td>*</td> <td></td> <td></td> </tr> </tbody> </table>	ID	Password	User group	00001	1234567	Admin	00002	1234567	Admin	00003	1234567	Staff	00004	1234567	Staff	00005	1234567	Staff	00006	1234567	Staff	00008	1234567	Researcher	00009	1234567	Researcher	00010	1234567	Researcher	00011		Public	*		
ID	Password	User group																																		
00001	1234567	Admin																																		
00002	1234567	Admin																																		
00003	1234567	Staff																																		
00004	1234567	Staff																																		
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00008	1234567	Researcher																																		
00009	1234567	Researcher																																		
00010	1234567	Researcher																																		
00011		Public																																		
*																																				

Form name
(Portal) General
Description
<p>It is the portal to general data. The users can see different form, report and query. When the users click the query, they need to enter the specified date. There is a navigation bar in the header. The public can move to different pages with button. (e.g., General, Vaccine, Medical, Community and Input). In the upper right corner, the user can see the current time, click the back button to return to the home page.</p>
Screenshot
 <p>The screenshot shows a mobile-style application interface. At the top, there is a navigation bar with five tabs: General, Vaccine, Medical, Community, and Input. On the far right of the bar is a "Back" button. The date "15-Apr-22 1:56" is displayed in the top right corner. Below the navigation bar, the word "General" is prominently displayed next to a gear icon. The main content area is divided into two sections: "List" and "Report". The "List" section contains three buttons: "List of Confirmed Cases", "History pandemic situation", and "Case by Covid". The "Report" section contains six buttons arranged in two columns: "Case by Covid", "Covid trending", "Case by age group", "Case trending", "Distribution of cases by age", "Case by district and date", and "Max, Min and Avg of patient".</p>

Form name

(General) Confirmed cases

Description

An interface for users to view records of all confirmed cases. In the upper right corner, the user can click the close button to close the form.

Screenshot

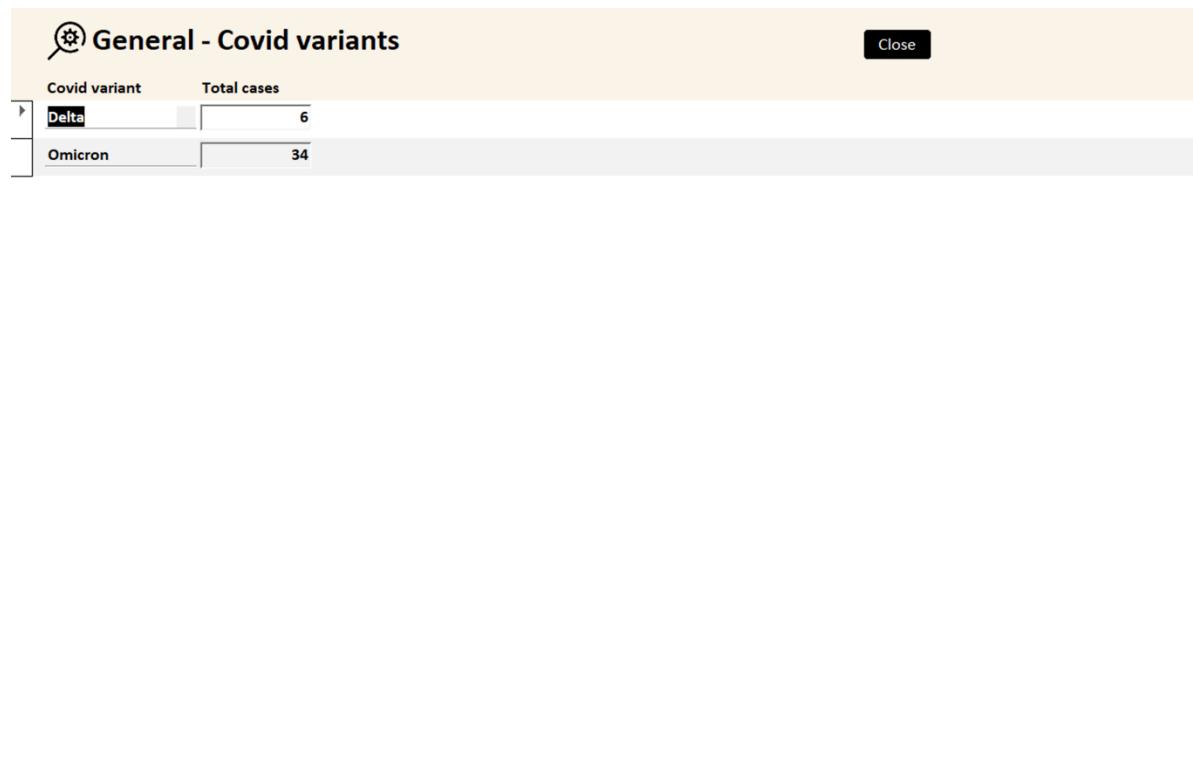
General - Confirmed cases						
Case	Covid	Age	Job	Nationality	Date	Condition
0001	Delta	18	Student	Hong Kong resident	15-Dec-21	Discharged
0002	Omicron	18	Student	Hong Kong resident	14-Dec-21	Discharged
0003	Omicron	43	Professc	Hong Kong resident	23-Dec-21	Discharged
0004	Omicron	41	Lawmak	Hong Kong resident	14-Jan-22	Discharged
0005	Omicron	40	Student	Hong Kong resident	20-Jan-22	Discharged
0006	Delta	31	Nurse	Hong Kong resident	02-Feb-22	Hospitalized
0007	Omicron	27	Student	Hong Kong resident	05-Feb-22	Hospitalized
0008	Omicron	65	Student	Hong Kong resident	10-Feb-22	Deceased
0009	Omicron	18	Student	Hong Kong resident	16-Feb-22	Hospitalized
0010	Delta	81	Jobless	British	18-Feb-22	Deceased
0011	Delta	75	Jobless	United States	21-Feb-22	Deceased
0012	Omicron	43	Profers	Hong Kong resident	01-Apr-22	Hospitalized
0013	Omicron	30	Clerk	Hong Kong resident	01-Apr-22	Hospitalized
0014	Omicron	27	Jobless	Hong Kong resident	01-Apr-22	Hospitalized
0015	Omicron	12	Student	Hong Kong resident	01-Mar-22	Deceased
0016	Omicron	72	Jobless	Hong Kong resident	01-Apr-22	Deceased
0017	Omicron	18	Police	Hong Kong resident	01-Apr-22	Hospitalized
0018	Omicron	29	Bus driv	Hong Kong resident	02-Apr-22	Hospitalized

Form name

(Portal) Case by Covid

Description

This is an interface that allows the user to view the total number of cases for different variants of the virus. In the upper right corner, the user can click the close button to close the form.

Screenshot

Form name

(General) Past pandemic situation

Description

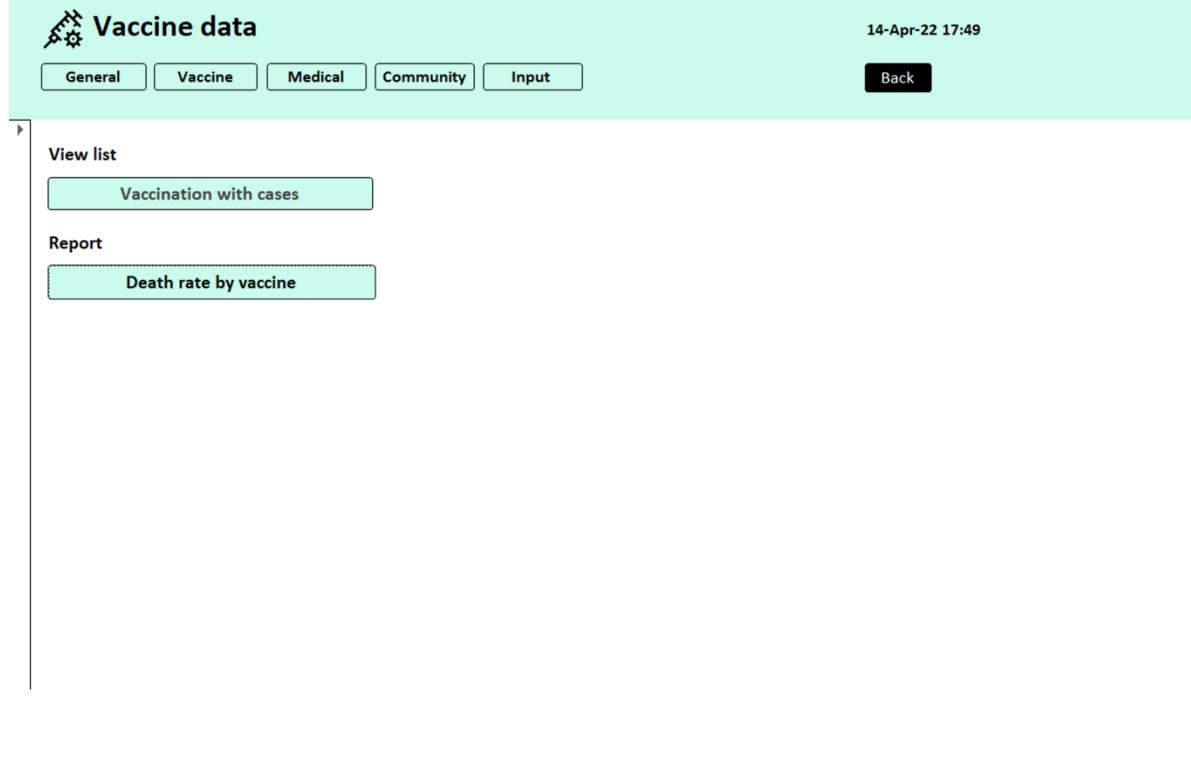
An interface for users to view records of Hong Kong's total cases and input cases, number of vaccinated people, discharged or deceased patients by date, the user can click the close button to close the form.

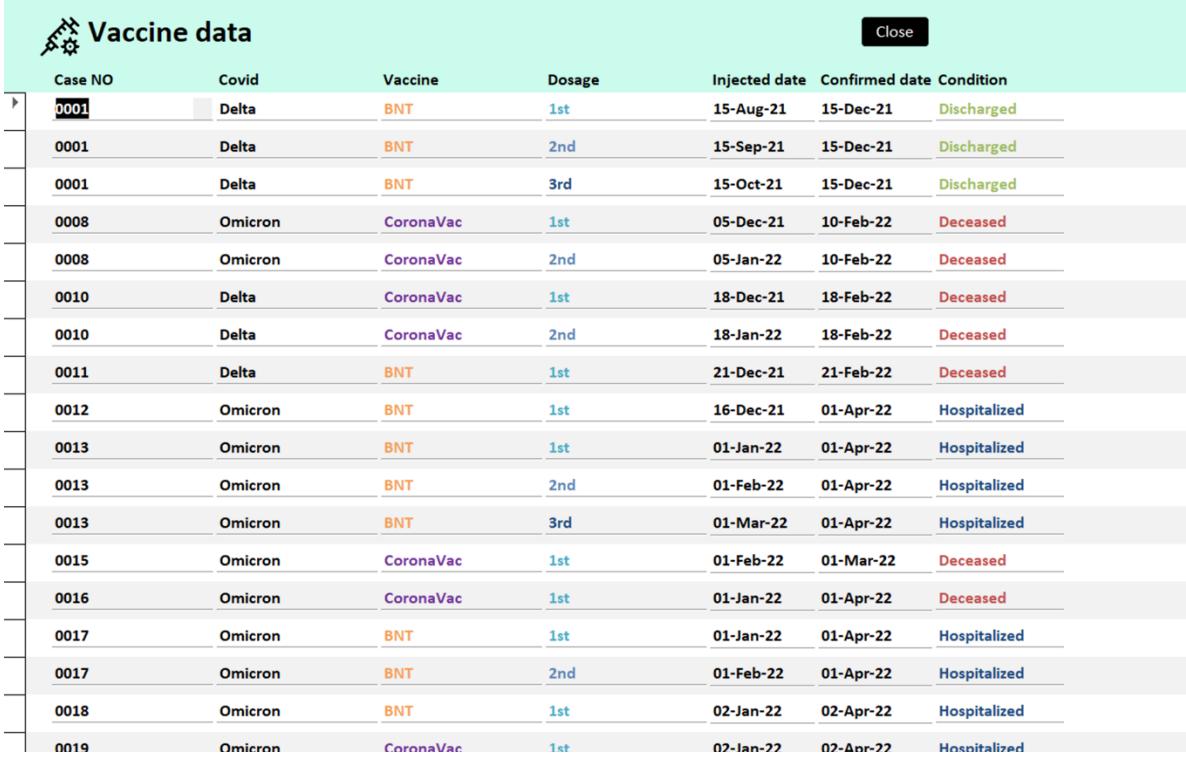
Screenshot

General - Past pandemic situation

Close

DATE	TOTAL	INPUT	VACCINATED	DISCHARGED	DECEASED
8/15/2021	0	0	1	0	0
9/15/2021	0	0	1	0	0
10/15/2021	0	0	1	0	0
12/5/2021	0	0	1	0	0
12/14/2021	1	0	0	0	0
12/15/2021	1	0	0	0	0
12/16/2021	0	0	1	0	0
12/18/2021	0	0	1	0	0
12/21/2021	0	0	1	0	0
12/23/2021	1	0	0	0	0
1/1/2022	0	0	3	0	0
1/2/2022	0	0	12	0	0
1/3/2022	0	0	2	0	0
1/5/2022	0	0	1	0	0
1/14/2022	1	0	0	0	0
1/18/2022	0	0	1	0	0

Form name (Portal) Vaccine data
Description It is the portal to vaccine data. The users can see different form and report. There is a navigation bar in the header. The user can move to different pages with button. (e.g., General, Vaccine, Medical, Community and Input). In the upper right corner, the user can see the current time, click the back button to return to the home page.
Screenshot 

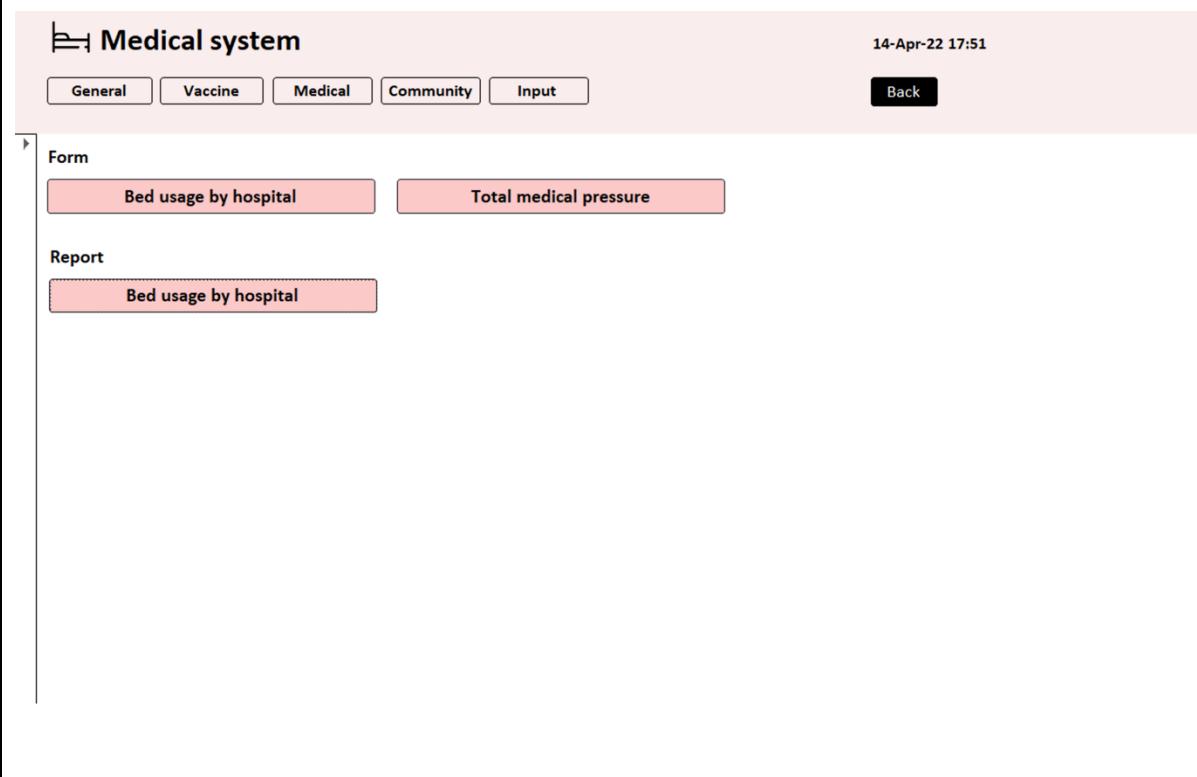
Form name																																																																																																																																					
(Portal) Vaccine history record																																																																																																																																					
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The interface for users to view all vaccination records. In the upper right corner, the user can click the close button to close the form.																																																																																																																																					
Screenshot																																																																																																																																					
 <p>The screenshot shows a table titled "Vaccine data" with a "Close" button in the top right corner. The table has columns: Case NO, Covid, Vaccine, Dosage, Injected date, Confirmed date, and Condition. The data is as follows:</p> <table border="1"> <thead> <tr> <th>Case NO</th> <th>Covid</th> <th>Vaccine</th> <th>Dosage</th> <th>Injected date</th> <th>Confirmed date</th> <th>Condition</th> </tr> </thead> <tbody> <tr><td>0001</td><td>Delta</td><td>BNT</td><td>1st</td><td>15-Aug-21</td><td>15-Dec-21</td><td>Discharged</td></tr> <tr><td>0001</td><td>Delta</td><td>BNT</td><td>2nd</td><td>15-Sep-21</td><td>15-Dec-21</td><td>Discharged</td></tr> <tr><td>0001</td><td>Delta</td><td>BNT</td><td>3rd</td><td>15-Oct-21</td><td>15-Dec-21</td><td>Discharged</td></tr> <tr><td>0008</td><td>Omicron</td><td>CoronaVac</td><td>1st</td><td>05-Dec-21</td><td>10-Feb-22</td><td>Deceased</td></tr> <tr><td>0008</td><td>Omicron</td><td>CoronaVac</td><td>2nd</td><td>05-Jan-22</td><td>10-Feb-22</td><td>Deceased</td></tr> <tr><td>0010</td><td>Delta</td><td>CoronaVac</td><td>1st</td><td>18-Dec-21</td><td>18-Feb-22</td><td>Deceased</td></tr> <tr><td>0010</td><td>Delta</td><td>CoronaVac</td><td>2nd</td><td>18-Jan-22</td><td>18-Feb-22</td><td>Deceased</td></tr> <tr><td>0011</td><td>Delta</td><td>BNT</td><td>1st</td><td>21-Dec-21</td><td>21-Feb-22</td><td>Deceased</td></tr> <tr><td>0012</td><td>Omicron</td><td>BNT</td><td>1st</td><td>16-Dec-21</td><td>01-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0013</td><td>Omicron</td><td>BNT</td><td>1st</td><td>01-Jan-22</td><td>01-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0013</td><td>Omicron</td><td>BNT</td><td>2nd</td><td>01-Feb-22</td><td>01-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0013</td><td>Omicron</td><td>BNT</td><td>3rd</td><td>01-Mar-22</td><td>01-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0015</td><td>Omicron</td><td>CoronaVac</td><td>1st</td><td>01-Feb-22</td><td>01-Mar-22</td><td>Deceased</td></tr> <tr><td>0016</td><td>Omicron</td><td>CoronaVac</td><td>1st</td><td>01-Jan-22</td><td>01-Apr-22</td><td>Deceased</td></tr> <tr><td>0017</td><td>Omicron</td><td>BNT</td><td>1st</td><td>01-Jan-22</td><td>01-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0017</td><td>Omicron</td><td>BNT</td><td>2nd</td><td>01-Feb-22</td><td>01-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0018</td><td>Omicron</td><td>BNT</td><td>1st</td><td>02-Jan-22</td><td>02-Apr-22</td><td>Hospitalized</td></tr> <tr><td>0019</td><td>Omicron</td><td>CoronaVac</td><td>1st</td><td>02-Jan-22</td><td>02-Apr-22</td><td>Hospitalized</td></tr> </tbody> </table>	Case NO	Covid	Vaccine	Dosage	Injected date	Confirmed date	Condition	0001	Delta	BNT	1st	15-Aug-21	15-Dec-21	Discharged	0001	Delta	BNT	2nd	15-Sep-21	15-Dec-21	Discharged	0001	Delta	BNT	3rd	15-Oct-21	15-Dec-21	Discharged	0008	Omicron	CoronaVac	1st	05-Dec-21	10-Feb-22	Deceased	0008	Omicron	CoronaVac	2nd	05-Jan-22	10-Feb-22	Deceased	0010	Delta	CoronaVac	1st	18-Dec-21	18-Feb-22	Deceased	0010	Delta	CoronaVac	2nd	18-Jan-22	18-Feb-22	Deceased	0011	Delta	BNT	1st	21-Dec-21	21-Feb-22	Deceased	0012	Omicron	BNT	1st	16-Dec-21	01-Apr-22	Hospitalized	0013	Omicron	BNT	1st	01-Jan-22	01-Apr-22	Hospitalized	0013	Omicron	BNT	2nd	01-Feb-22	01-Apr-22	Hospitalized	0013	Omicron	BNT	3rd	01-Mar-22	01-Apr-22	Hospitalized	0015	Omicron	CoronaVac	1st	01-Feb-22	01-Mar-22	Deceased	0016	Omicron	CoronaVac	1st	01-Jan-22	01-Apr-22	Deceased	0017	Omicron	BNT	1st	01-Jan-22	01-Apr-22	Hospitalized	0017	Omicron	BNT	2nd	01-Feb-22	01-Apr-22	Hospitalized	0018	Omicron	BNT	1st	02-Jan-22	02-Apr-22	Hospitalized	0019	Omicron	CoronaVac	1st	02-Jan-22	02-Apr-22	Hospitalized
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0019	Omicron	CoronaVac	1st	02-Jan-22	02-Apr-22	Hospitalized																																																																																																																															

Form name

(Portal) Medical system

Description

It is the portal to medical data. The users can see different form and report. There is a navigation bar in the header. The user can move to different pages with button. (e.g., General, Vaccine, Medical, Community and Input). In the upper right corner, the user can see the current time, click the back button to return to the home page.

Screenshot

Form name

(Hospital) Bed usage by hospital

Description

This is an interface that allows users to view the total number of beds a hospital has for COVID-19 patients, as well as the number of beds occupied. In the upper right corner, the user can click the close button to close the form.

Screenshot

Medical system - Bed usage by hospital		Close	
Hospital	Hospital type	Used beds	Total beds
Fanling Community Isolation Facility	Community Isolation Facility	1	12
Penny's Bay Community Isolation Facility	Community Isolation Facility	1	12
Evangel Hospital	Private Hospital	1	20
Hong Kong Baptist Hospital	Private Hospital	1	20
Precious Blood Hospital	Private Hospital	1	20
St Teresa's Hospital	Private Hospital	1	20
Caritas Medical Centre	Public Hospital	9	20
Kwong Wah Hospital	Public Hospital	2	20
Queen Elizabeth Hospital	Public Hospital	3	20
United Christian Hospital	Public Hospital	7	20

 **Medical system - Total medical pressure**

Used beds	Total beds	Pressure
27	184	0.15

Close

Form name

(Hospital) Total medical pressure

Description

This is an interface that allows users to view the total number of beds provided to covid patients and the total number of beds occupied by existing covid patients, and to judge the pressure on the medical system. In the upper right corner, the user can click the close button to close the form.

Screenshot

Form name
(Portal) Community tracking
Description
<p>It is the portal for community tracking data. The users can see different form and report.</p> <p>There is a navigation bar in the header. The user can move to different pages with button. (e.g., General, Vaccine, Medical, Community and Input). In the upper right corner, the user can see the current time, click the back button to return to the home page.</p>
Screenshot

Form name

(Trace) Visits building list

Description

The interface for users to view all records of building with case visited. In the upper right corner, the user can click the close button to close the form.

Screenshot

Community tracking - Visit building list			Close
BLDG_DIST	BLDG_NAME	VIS_DT	
Kowloon City	City University of Hong Kong	01-Dec-21	
Kowloon City	Evangel Hospital	04-Apr-22	
Kowloon City	Hong Kong Baptist Hospital	04-Apr-22	
Yau Tsim Mong	Kwong Wah Hospital	04-Apr-22	
Yau Tsim Mong	Kwong Wah Hospital	21-Apr-22	
Sham Shui Po	Lai Kok Estate	13-Mar-22	
Sham Shui Po	Pei Ho Street Market	13-Mar-22	
Kowloon City	PolyU Hung Hom Bay Campus	04-Jan-22	
Yau Tsim Mong	PolyU West Kowloon Campus	04-Jan-22	
Yau Tsim Mong	Queen Elizabeth Hospital	13-Mar-22	
Kowloon City	The Hong Kong Polytechnic University	04-Jan-22	

Form name

(Trace) Local transportation list

Description

The interface for users to view all records of local transportation with case visited. In the upper right corner, the user can click the close button to close the form.

Screenshot

Community tracking - Local transportation list					
Case	Date	Destination	Transport	Route	Company
0001	01-Dec-21	Ho Man Tin Station	On foot		
0001	01-Dec-21	Hung Hom Station	Public transport	Tuen Ma Line	MTR
0001	01-Dec-21	Kowloon Tong Station	Public transport	East Rail Line	MTR
0001	01-Dec-21	Hung Hom Station	Public transport	East Rail Line	MTR
0001	01-Dec-21	Ho Man Tin Station	Public transport	Tuen Ma Line	MTR
0003	04-Jan-22	PolyU West Kowloon Campus	Drive		
0003	04-Jan-22	PolyU Hung Hom Bay Campus	Drive		
0003	04-Jan-22	The Hong Kong Polytechnic University	Drive		
0010	13-Mar-22	Wylie Road	Public transport	13X	KMB
0010	13-Mar-22	Jordan Station	Public transport	Tsuen Wan Line	MTR
0010	13-Mar-22	Cheung Sha Wan Station	Public transport	Tsuen Wan Line	MTR
0010	13-Mar-22	Prince Edward Station	Public transport	Tsuen Wan Line	MTR
0010	13-Mar-22	Choi Hung Station	Public transport	Kwun Tong Line	MTR
0031	04-Apr-22	Hong Kong Baptist Hospital	Drive		
0031	04-Apr-22	Evangel Hospital	Drive		
0031	04-Apr-22	Kwong Wah Hospital	Drive		
*					

Form name

(Trace) Case by districts and date

Description

An interface where users can view the number of cases by district and date. In the upper right corner, the user can click the close button to close the form.

Screenshot

Community tracking - District transmission			Close
District	Date	Cases	
Kowloon City	14-Dec-21	1	
Kowloon City	15-Dec-21	1	
Kowloon City	23-Dec-21	1	
Kowloon City	14-Jan-22	1	
Kowloon City	05-Feb-22	1	
Kowloon City	16-Feb-22	1	
Kowloon City	18-Feb-22	1	
Kowloon City	21-Feb-22	1	
Kowloon City	01-Mar-22	1	
Kowloon City	01-Apr-22	4	
Kowloon City	02-Apr-22	9	
Kowloon City	03-Apr-22	9	
Sham Shui Po	20-Jan-22	1	
Sham Shui Po	02-Feb-22	1	
Sham Shui Po	10-Feb-22	1	
Sham Shui Po	03-Apr-22	2	
Wong Tai Sin	01-Apr-22	1	
Wong Tai Sin	02-Apr-22	1	
Wong Tai Sin	03-Apr-22	2	

Form name

(Trace) Resides building list

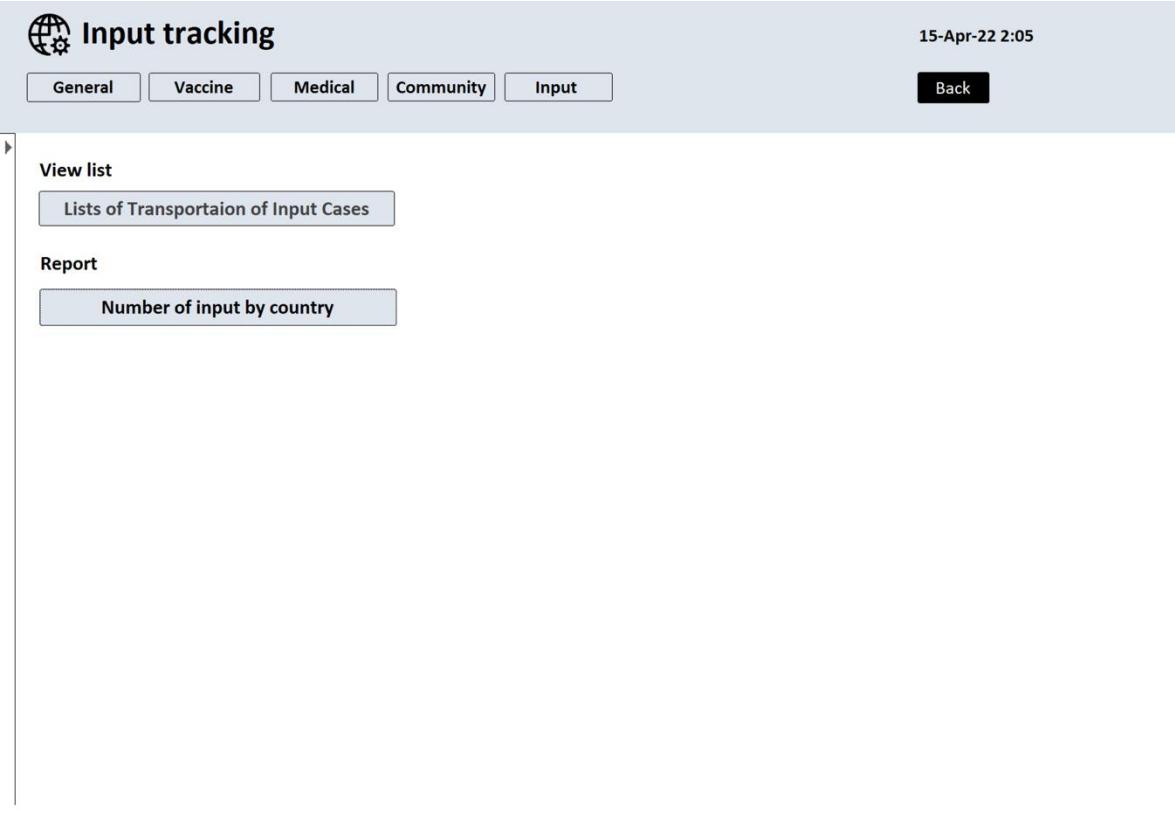
Description

An interface where users can view the number of confirmed cases in different residential buildings. In the upper right corner, the user can click the close button to close the form.

Screenshot

The screenshot shows a mobile application interface titled "Community tracking - Resides building list". The title is at the top left, and a "Close" button is at the top right. Below the title is a table with two columns: "Estate" and "Cases". The table lists six entries:

Estate	Cases
Choi Hung Estate	2
Ho Man Tin Estate	5
Hung Hom Estate	8
Kai Ching Estate	5
Lai Kok Estate	3
Sorrento	4

Form name (Portal) Input tracking
Description It is a portal for input tracking data. The users can see different form and report. There is a navigation bar in the header. The user can move to different pages with button. (e.g., General, Vaccine, Medical, Community and Input). In the upper right corner, the user can see the current time, click the back button to return to the home page.
Screenshot  <p>The screenshot shows a mobile-style interface for 'Input tracking'. At the top, there's a navigation bar with five tabs: General, Vaccine, Medical, Community, and Input. The 'Input' tab is currently active, indicated by a dark background. To the right of the tabs, the date and time '15-Apr-22 2:05' are displayed. Below the navigation bar, there are two main sections: 'View list' and 'Report'. Under 'View list', there is a single item: 'Lists of Transportaion of Input Cases'. Under 'Report', there is also a single item: 'Number of input by country'. A 'Back' button is located at the bottom right of the screen.</p>

Form name

(Input) Input record

Description

The interface for users to view all records of transportation with input cases. In the upper right corner, the user can click the close button to close the form.

Screenshot

Input tracking							
Case no	Country	Transport	Series no	Seat no	Covid	Date	Condition
0011	United States	Aeroplane	TK83	36	Delta	21-Feb-22	Deceased
0019	Japan	Aeroplane	CX6321	8	Omicron	02-Apr-22	Hospitalized
0026	Japan	Aeroplane	CX6321	12	Omicron	02-Apr-22	Hospitalized
0028	Japan	Aeroplane	CX6321	36	Omicron	03-Apr-22	Hospitalized
0034	Japan	Aeroplane	CX6321	66	Omicron	03-Apr-22	Critical
0035	Germany	Aeroplane	CX9202	4	Omicron	03-Apr-22	Hospitalized
0037	China	Shenzhen Bay			Omicron	03-Apr-22	Deceased
0038	China	Shenzhen Bay			Omicron	03-Apr-22	Deceased
0039	Singapore	Aeroplane	A350-900	20	Omicron	03-Apr-22	Hospitalized

Report name:

(Trace) Resided building list

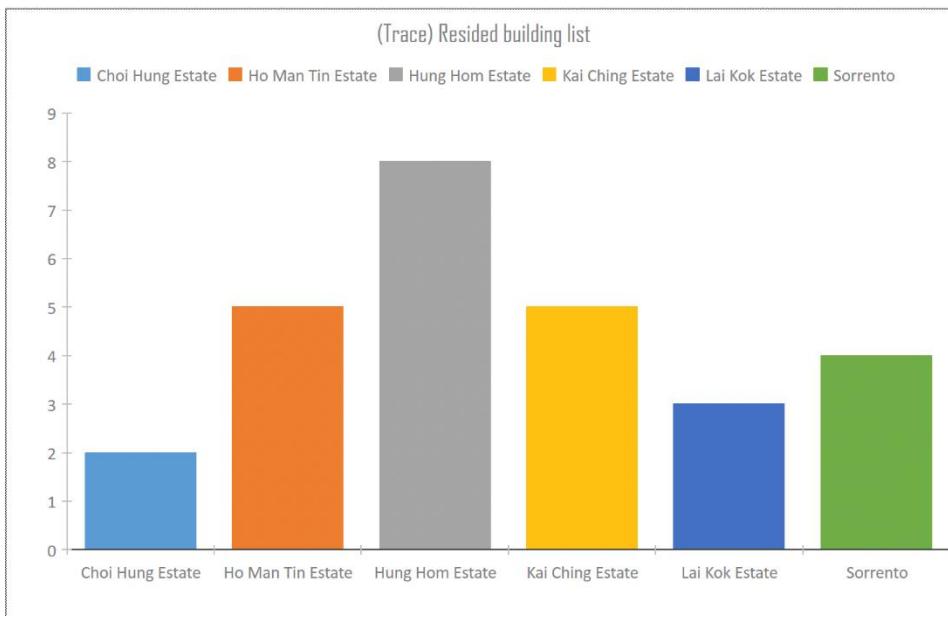
Report purpose:

This pie chart shows the data for infection cases in different buildings.

All User groups (admin, staff, research, public) have read access to this data.

This is a trace target report, the purpose is to provide users with faster access to patient travel or contact records. This helps all user groups to have a direct view of the data trend and statistical data for the type of infection, the infection cases in different buildings.

Contain a more accurate investment of human and material resources inside the time from covid.

Report screenshot:**Report name:**

(General) Case by age group

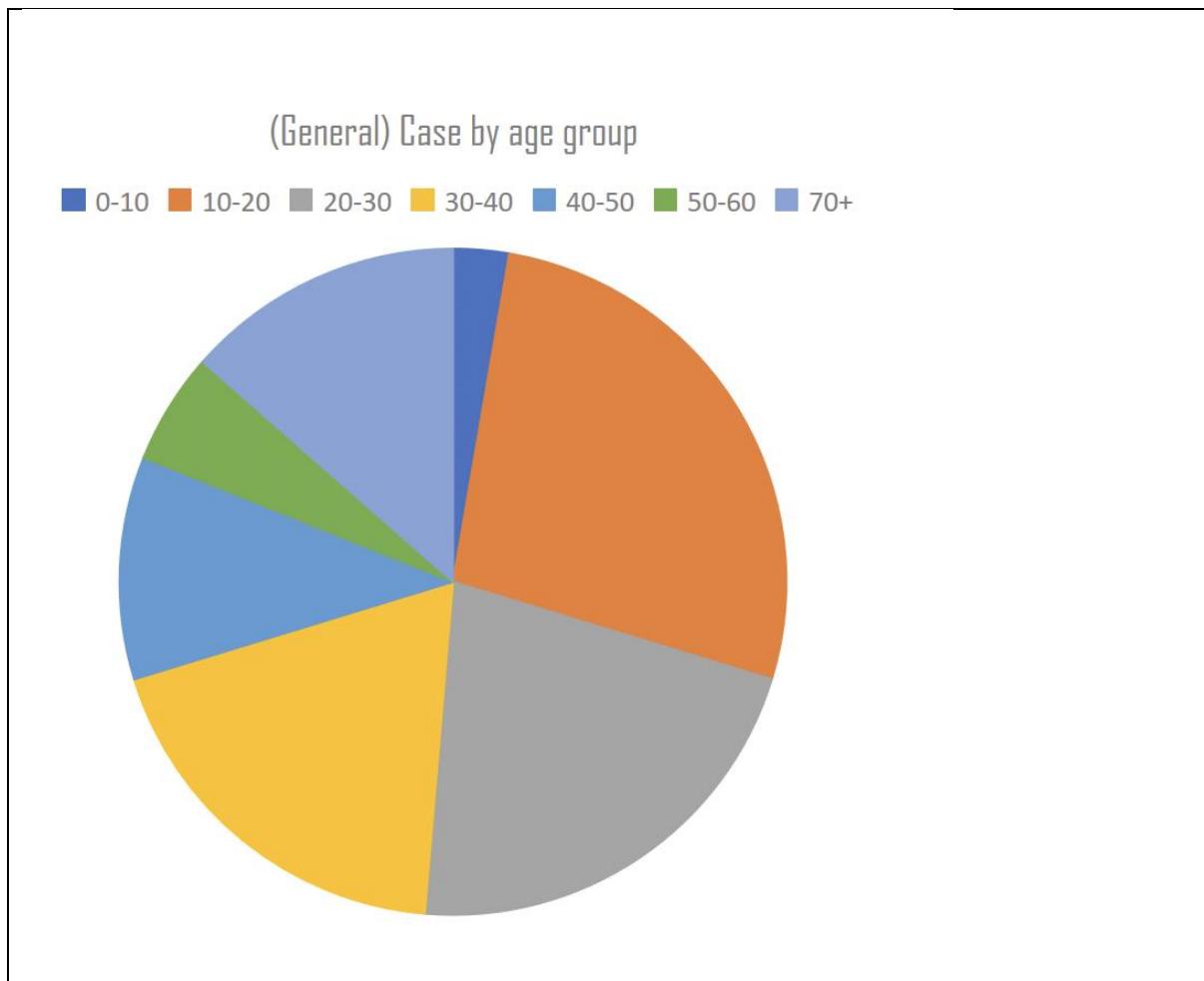
Report purpose:

This pie chart shows the specific gravity for infection case in different age groups.

All User groups (admin, staff, research, public) have read access to this data.

This provides a specific gravity for the infection case in different age groups, which helps all user groups to have a quick view for the infection status, to let government and community develop appropriate plans and arrangements.

Report screenshot:



Report name:

(Trace) Visits building list

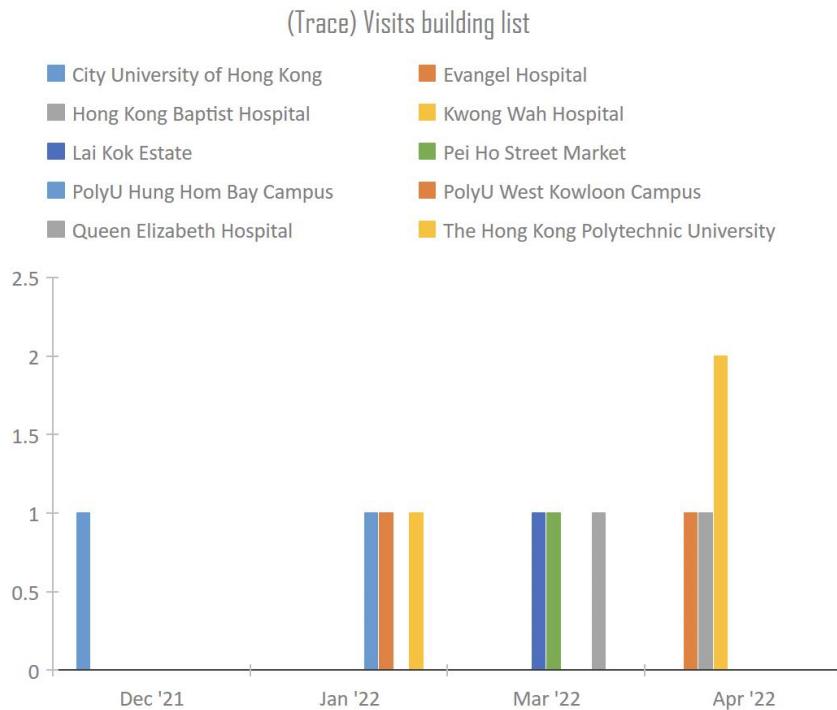
Report purpose:

This bar chart shows the building for the infected person visited count in special data.

All User groups (admin, staff, research, public) have access to this data.

This is also one of the traces target reports, this helps the user know the visit history for patients, reduces the risk for citizens(public), and lets the government have faster blocking of monitoring plans for covid.

Report screenshot



Report name:

(Input) No of input by country

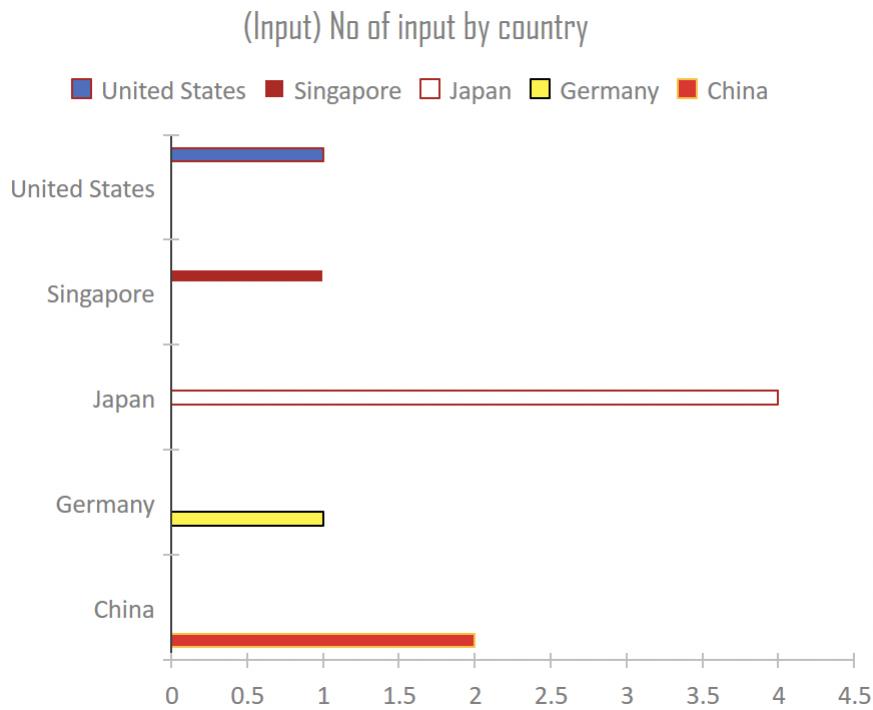
Report purpose:

This bar chart shows the data for the input infect case come from different country.

All User groups (admin, staff, researchers, public) have access for this data.

This help user to know the input cases in other country, the let the government have the policy to reduce the risk for citizen to visit these countries, carry virus back to Hong Kong.

Report screenshot



Report name:

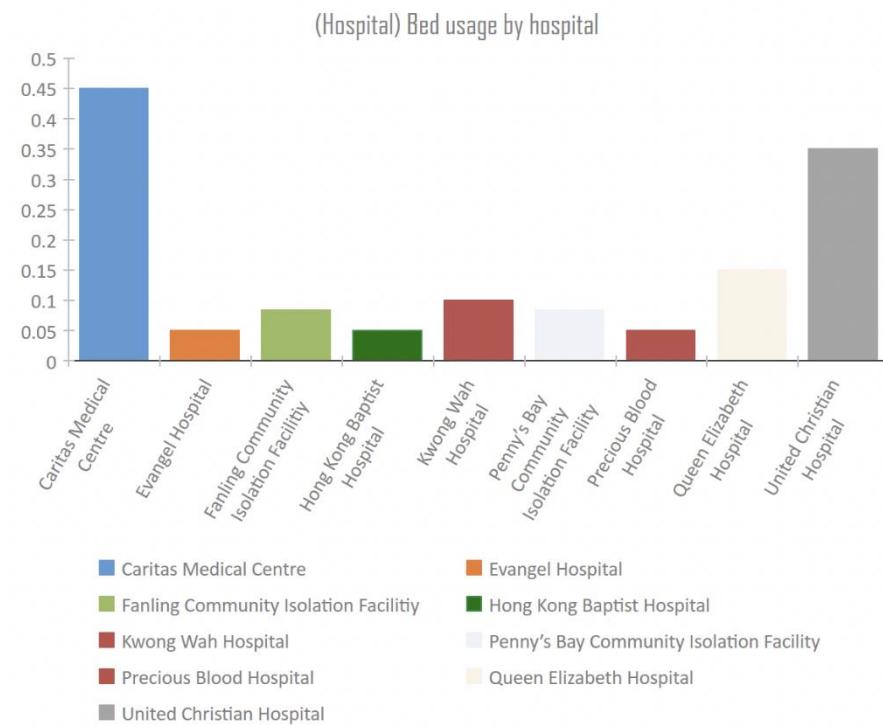
(Hospital) Bed usage by hospital

Report purpose:

This bar chart shows the data for bed use in different hospitals.

All User groups (admin, staff, researchers) have read access to this data.

This is equivalent to showing the medical facility load in this hospital, to make government adjusting for a more balanced and appropriate allocation of medical resources to this hospital.

Report screenshot:**Report name:**

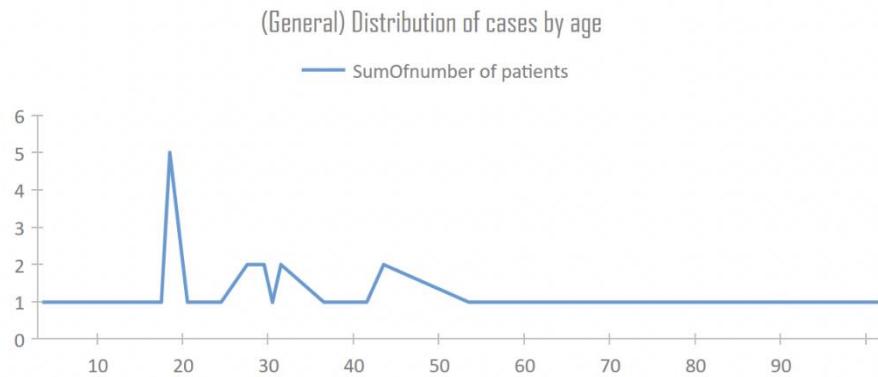
(General) Distribution of cases by age

Report purpose:

This line chart shows the data for patients inside the age group.

All User groups (admin, staff, researcher) have access to this data.

This shows the total number for patients in the age group, to provide a trend for patients for staff and researchers to do their own research and sorting project.

Report screenshot:

Report name:

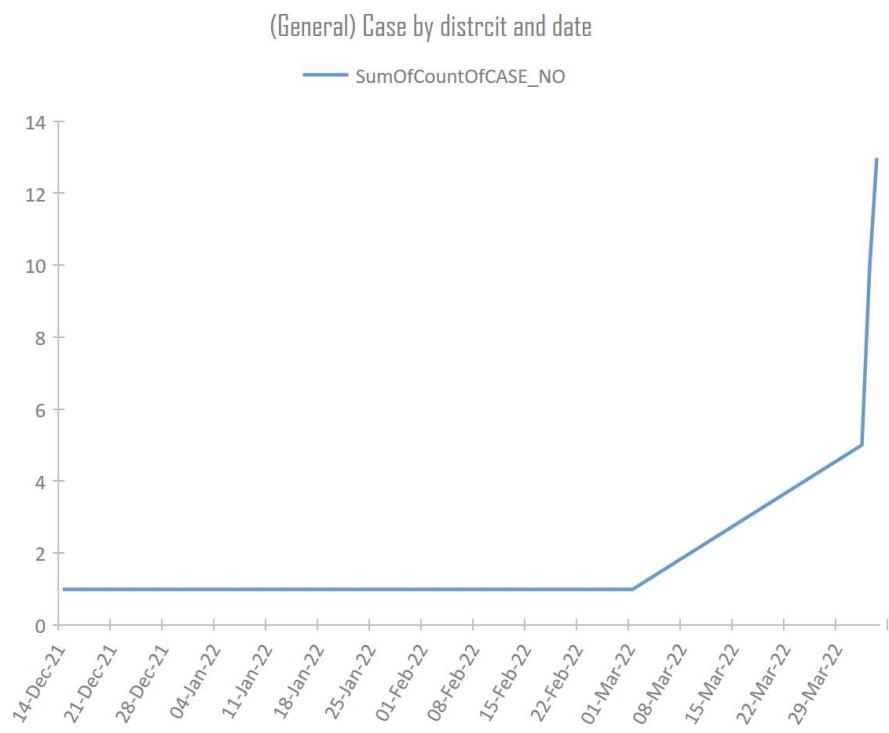
(General) Cases by date

Report purpose:

This line chart shows the data for case by district between a time period.

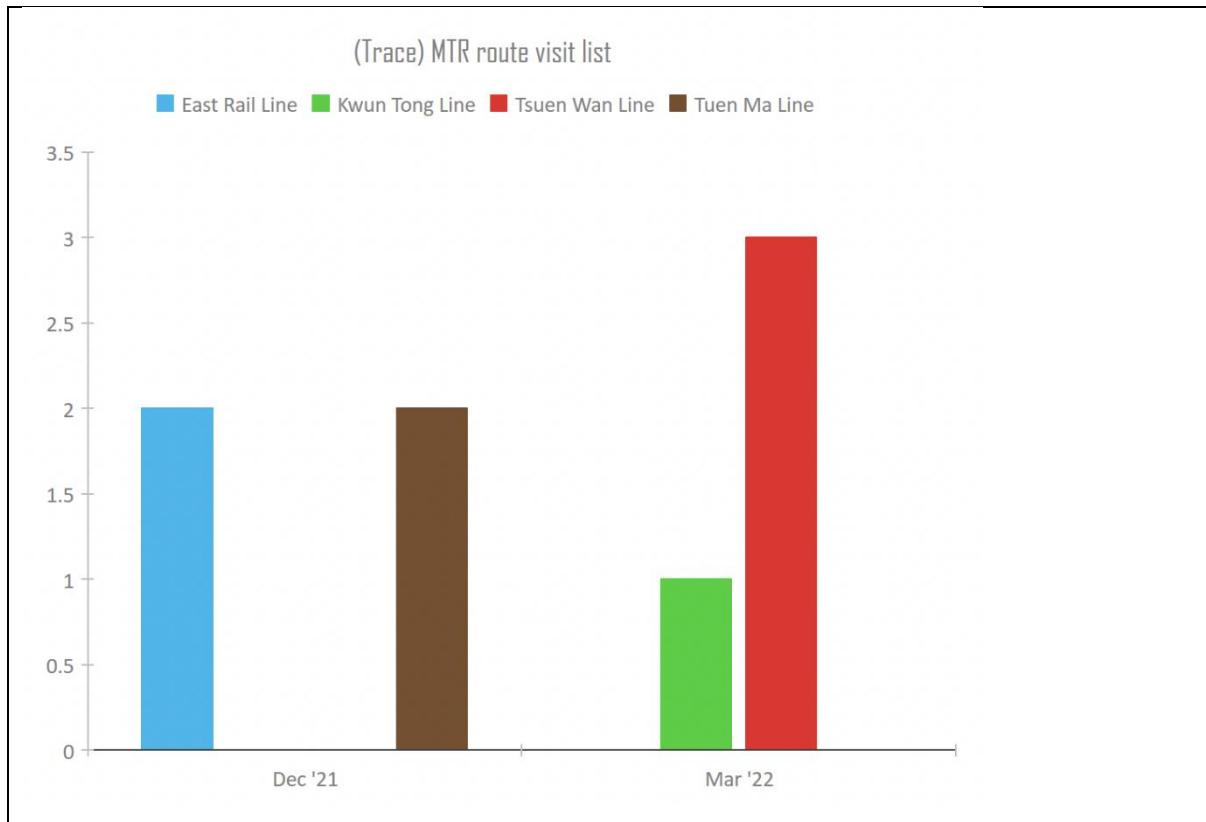
All User groups (admin, staff, researcher) have access to this data.

This directly shows to all visitors that the trend for the case for covid in a district, makes it easier for users to perform data analysis.

Report screenshot:

<p>Report name: (General) COVID by date</p>																																																			
<p>Report purpose: This line chart shows the number for covid in a time period. All User groups (admin, staff, researcher) have access to this data. This directly shows to all visitors that the trend for the case for covid makes it easier for users to perform data analysis.</p>																																																			
<p>Report screenshot:</p> <table border="1"> <thead> <tr> <th>Date</th> <th>Delta</th> <th>Omicron</th> </tr> </thead> <tbody> <tr><td>14-Dec-21</td><td>1</td><td>1</td></tr> <tr><td>21-Dec-21</td><td>0</td><td>0</td></tr> <tr><td>28-Dec-21</td><td>0</td><td>1</td></tr> <tr><td>04-Jan-22</td><td>0</td><td>1</td></tr> <tr><td>11-Jan-22</td><td>0</td><td>1</td></tr> <tr><td>18-Jan-22</td><td>0</td><td>1</td></tr> <tr><td>25-Jan-22</td><td>0</td><td>1</td></tr> <tr><td>01-Feb-22</td><td>1</td><td>0</td></tr> <tr><td>08-Feb-22</td><td>0</td><td>1</td></tr> <tr><td>15-Feb-22</td><td>0</td><td>1</td></tr> <tr><td>22-Feb-22</td><td>1</td><td>0</td></tr> <tr><td>01-Mar-22</td><td>0</td><td>0</td></tr> <tr><td>08-Mar-22</td><td>0</td><td>2</td></tr> <tr><td>15-Mar-22</td><td>0</td><td>4</td></tr> <tr><td>22-Mar-22</td><td>0</td><td>5</td></tr> <tr><td>29-Mar-22</td><td>1</td><td>12</td></tr> </tbody> </table>	Date	Delta	Omicron	14-Dec-21	1	1	21-Dec-21	0	0	28-Dec-21	0	1	04-Jan-22	0	1	11-Jan-22	0	1	18-Jan-22	0	1	25-Jan-22	0	1	01-Feb-22	1	0	08-Feb-22	0	1	15-Feb-22	0	1	22-Feb-22	1	0	01-Mar-22	0	0	08-Mar-22	0	2	15-Mar-22	0	4	22-Mar-22	0	5	29-Mar-22	1	12
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29-Mar-22	1	12																																																	

<p>Report name: (Trace) MTR route visit list</p>
<p>Report purpose: This bar chart shows the data for MTR route visit list. All User groups (admin, staff, researcher) have access to this data. This is also one of the traces target reports, This clearly shows the MTR station visiting history for infected people, which can let the government to make more reasonable, region-specific blockade and covid control plan.</p>
<p>Report screenshot:</p>



Report name:

(Trace) Resided building list by date

Report purpose:

This bar chart shows the data for the infected resided building list.

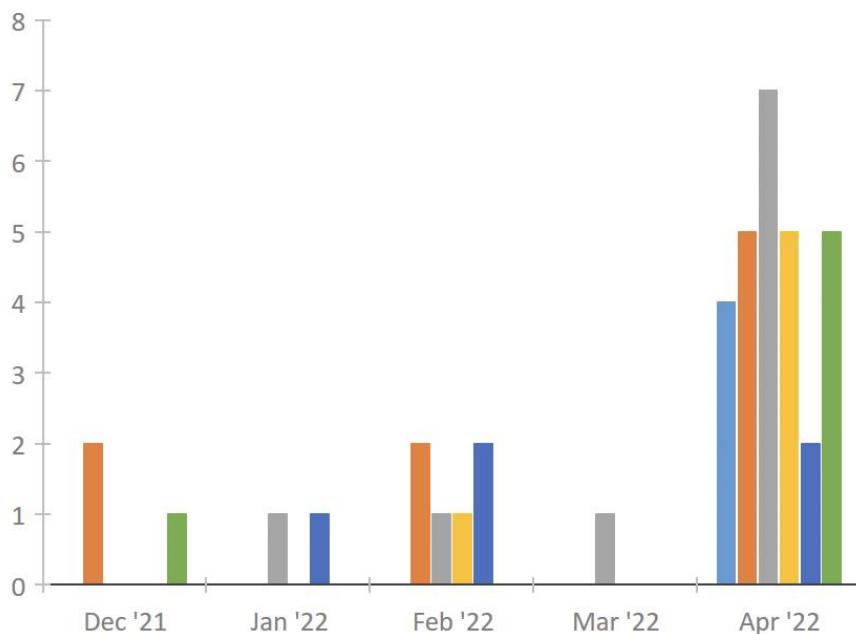
All User groups (admin, staff, researcher) have access to this data.

This is also one of the traces target reports, which let users have clean views of the living area of infected people.

Report screenshot:

(Trace) Resided building list by date

■ Choi Hung Estate ■ Ho Man Tin Estate ■ Hung Hom Estate
■ Kai Ching Estate ■ Lai Kok Estate ■ Sorrento

**Report name:**

(Trace) Transporation usage

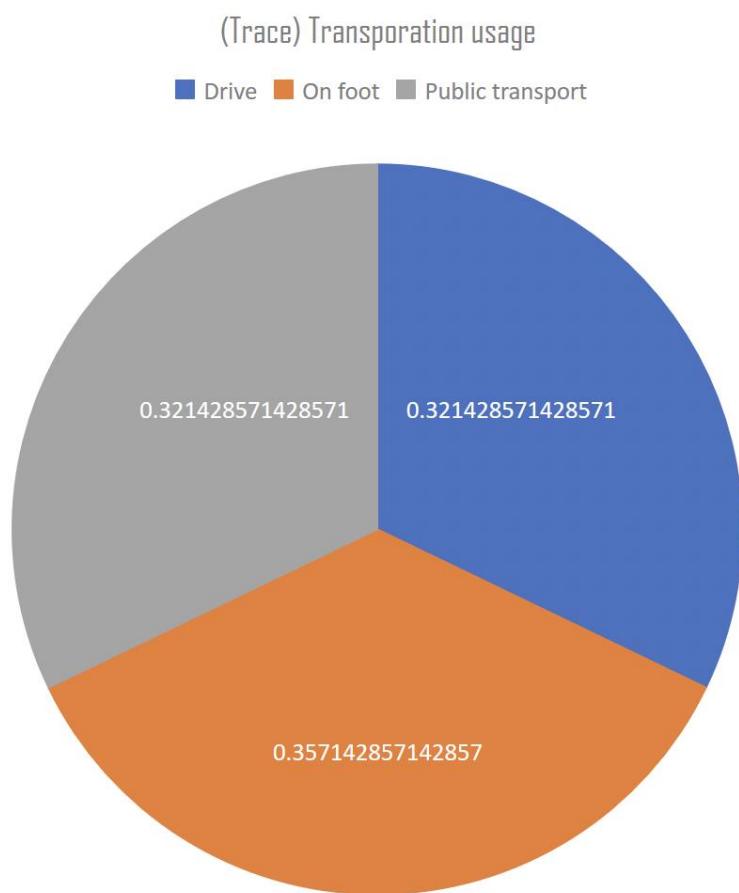
Report purpose:

This pie chart shows the percentage for transpiration usage.

All User groups (admin, staff, researcher) have access to this data.

This is also one of the traces target reports, which let users have clean views of the percentage for transpiration usage, let the government develop a plan which is more reasonable, targeted transportation.

Report screenshot:



Report name:

(Vaccine) Death rate by vaccine

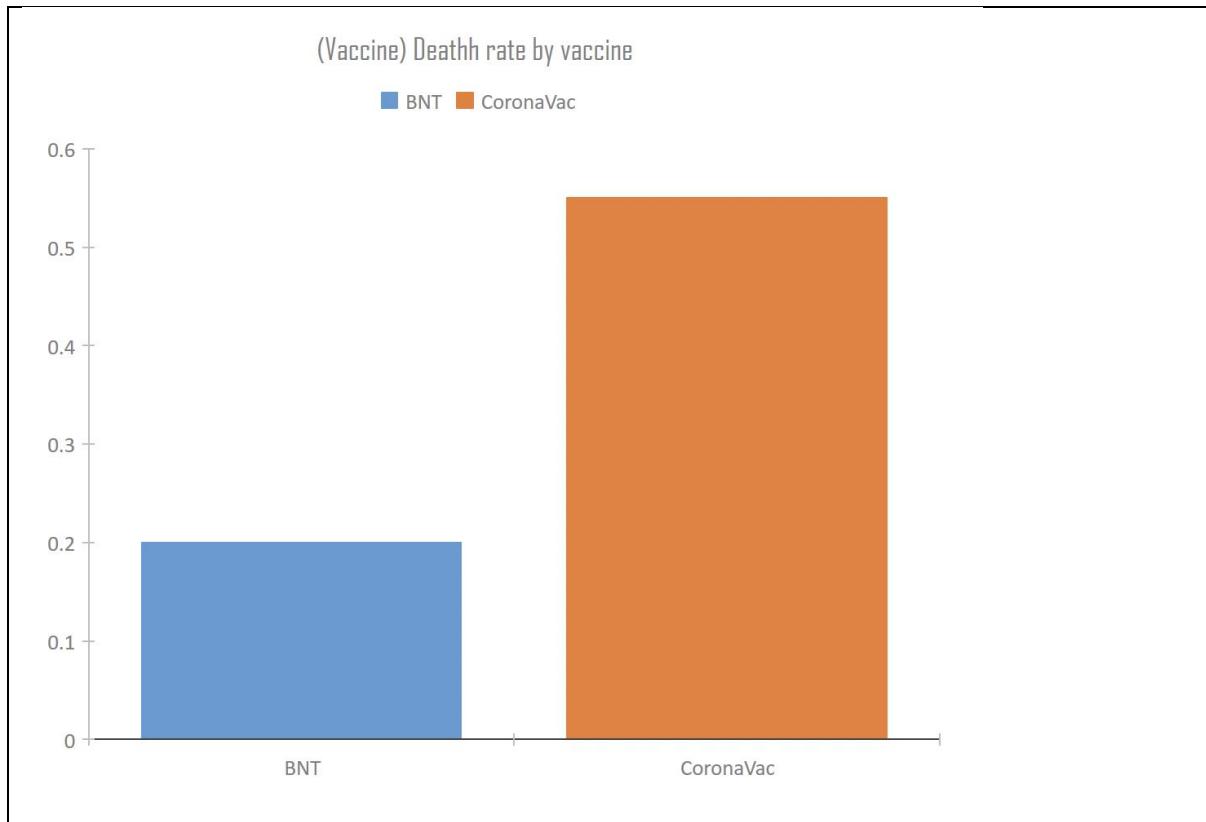
Report purpose:

This bar chart shows the death rate by vaccine.

All User groups (admin, staff, researcher) have access to this data.

This helps the government to determine which vaccine is safer and reduces the death rate by the vaccine.

Report screenshot:



7. Implementation details

(a) Software used

We use Access to build our COVID-19 cases tracking system, and we design different queries for figuring out the data which we wanted from the big data, for example, we can find out how many citizens are suffered by COVID-19 infection then we can analyze the infection trend of the epidemic in Hong Kong in the following days.

(b) Source of data

Items:

List of housing estate in BUILDING table

Reference:

Hong Kong Housing Authority website

Items:

List of stations and route in TRACE and TRANSPORT table

Reference:

MTR System map website

Items:

List of public hospitals in HOSPITAL table

Reference:

Hospital Authority website

Items:

List of private hospitals in HOSPITAL table

Reference:

Hospital Authority website

Items:

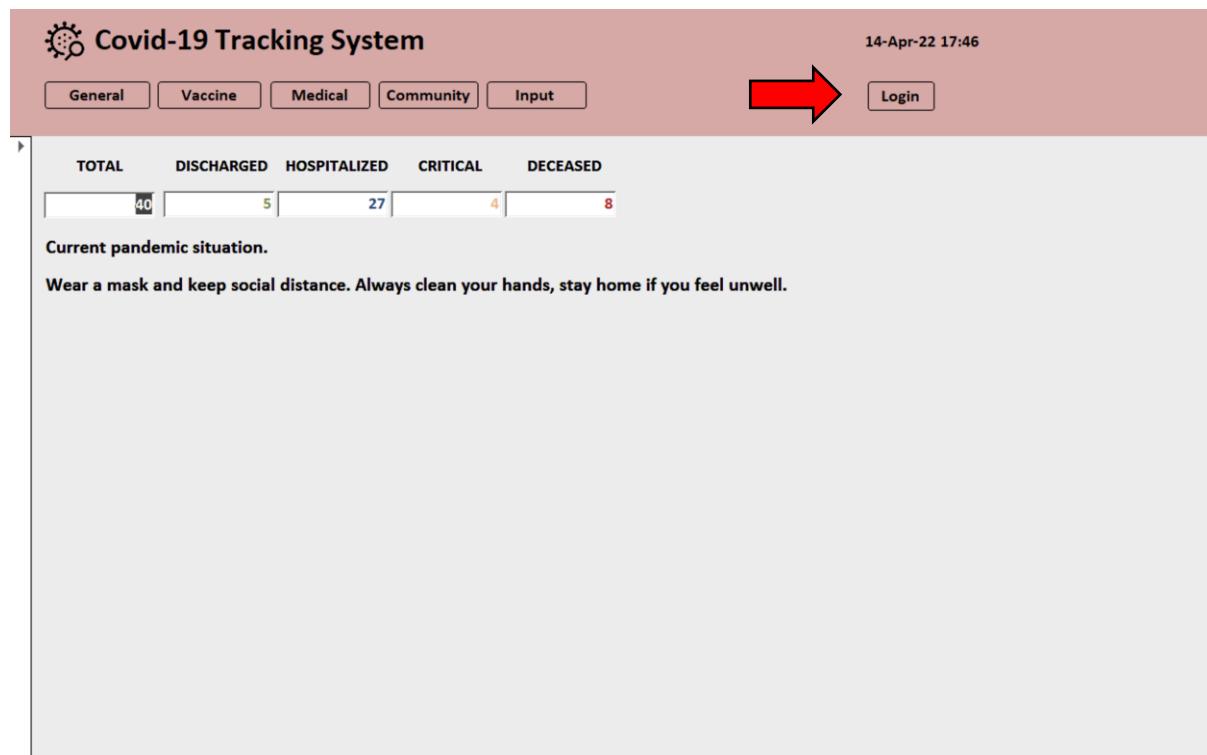
Table and form design ideas

Reference:

Government Covid-19 dashboard website

(c) Login system guide

1. Select “Login” button



2. Input ID and password using the table below:

The screenshot shows a login interface for the "Covid-19 Tracking System". At the top, there is a header bar with the title "Covid-19 Tracking System - Login" and the date "14-Apr-22 18:16". Below the header, a message says "Please enter your ID and password." There are two input fields: one for "ID" and one for "Password". A red arrow points to the "Password" field. Below the fields is a "Login" button. In the top right corner of the main area, there is a "Back" button.

ID	PW	USER_GP
00001	1234567	Admin
00002	1234567	Admin
00003	1234567	Staff
00004	1234567	Staff
00005	1234567	Staff
00006	1234567	Staff
00008	1234567	Researcher
00009	1234567	Researcher
00010	1234567	Researcher

8. Difficulties

(a) Design phase

Query

Before designing a query, we have to familiarize ourselves with using Query Design View and writing SQL statements. Although we get tips on SQL tutorial lessons, it is not enough for us to build up more complicated queries. For example, a nested sub-query is not taught in the tutorials, so we have to find some examples or guidelines to guide us to write some

complicated SQL statements. Moreover, we are getting obstacles while writing those of the SQLs, such as different syntax errors and naming problems.

Form

When designing a form, I need to retrieve my old tutorials and search the internet to learn how to design an interface that can perform different queries and forms. I also need to change some of the original field names to user friendly names and decide which attributes to display for public viewing.

Report

When designing a report, it is hard to visualize complex data in a straightforward way and difficult to make a suitable report in various charts. For example, like the (Trace) Resided building a list by date report, it needs to show both data, building and construction statistics, if not choose the suitable charts and reasonable data display of x, y-axis, this will become an unclear expressions report.

(b) Implementation phase

Form

When implementing, we found that we need to provide different interfaces for different users. Therefore, we designed different portals for different users and different uses.

(c) Lessons learnt

After finishing this project, we found that our SQL writing skills and the organizational ability for managing databases are improved. Moreover, it deepened our understanding of creating a form, like should I go to the property sheet to put different functions in buttons. Apart from the technical way, personally, we deeply understand what Teamwork is and how it can be fulfilled/executed. We have also emulated some effective peers in our group to lead the flow of the project (like what things we need to do now, and what the next step is). Moreover, the most important benefit is that we possess problem-solving skills during the project.

9. Conclusion

Through our project of COVID-19 tracking system, it's been proven that the database is good for managing big data. As you can see through our system, using database can help the government to track the confirm case where they go or why they are infected COVID-19 and ensure their anti-epidemic policies are executed effectively. Also, we have used the knowledge what we learnt in lesson, such as drawing Entity Relationship Diagram or writing SQL to design our project, that increases our understanding of lesson knowledge.

10. Reference

Hong Kong Housing Authority website:

<https://www.housingauthority.gov.hk/en/global-elements/estate-locator/index.html>

MTR System map website:

https://www.mtr.com.hk/en/customer/services/system_map.html

Hospital Authority website:

https://www.ha.org.hk/visitor/ha_visitor_index.asp?Content_ID=10036&Lang=ENG&Ver=HTML

https://www3.ha.org.hk/n tec/content/privatehospital_e.asp

Government Covid-19 dashboard website:

<https://chp-dashboard.geodata.gov.hk/covid-19/zh.html>