Introduction:

For the database we chose to design, we decided to model it after a medical office. The reason why we chose a medical/doctor office as a database to create, is we believe designing a database for a medical office will give us a deeper understanding of such a business. This will allow us to understand the relationships between staff, and patients. Giving us an understanding of what it takes to be considered an actual doctor's office. When it comes to the dataset for this project, a problem that we ran upon was confidentiality. No reasonable and legitimate medical office will just give out patient information to anyone, so to work around this most of the patient information such as address, name, ssn, etc. will be made up. Even though the data for the attributes are made up, the format and information added will be reasonable.

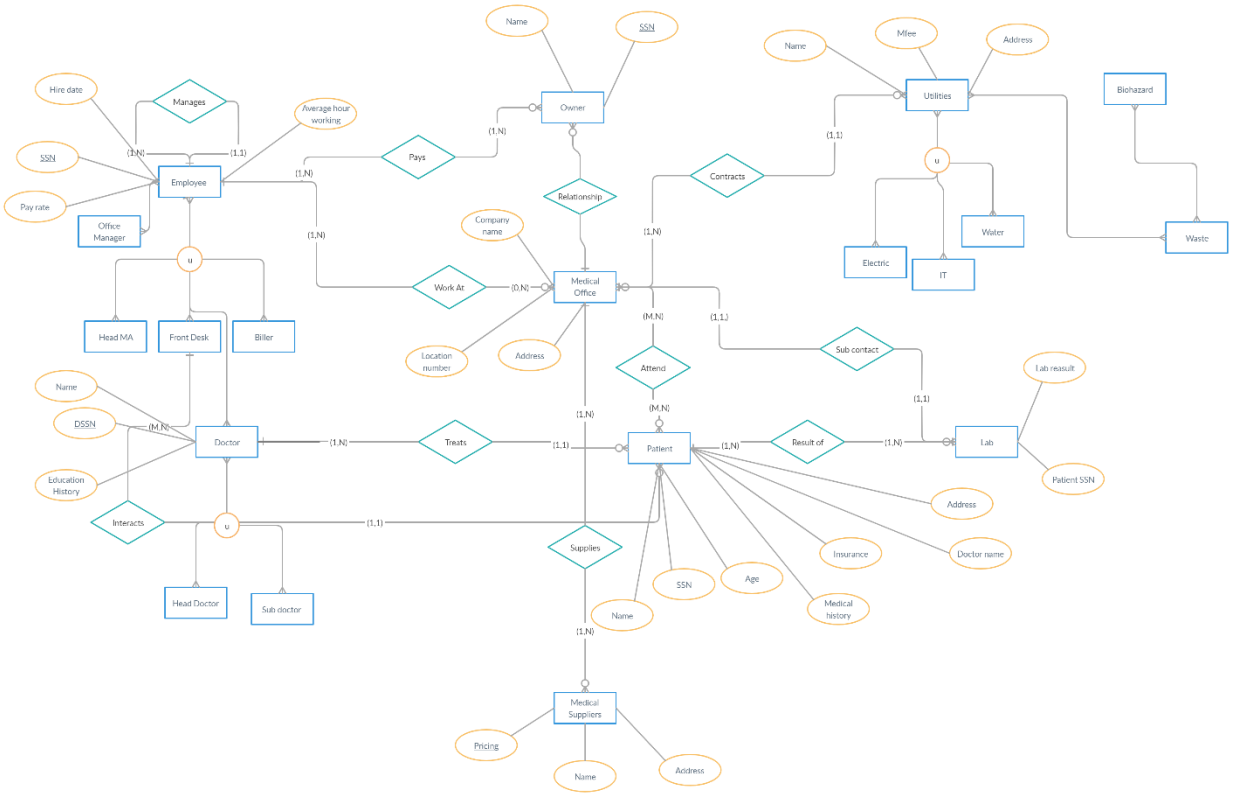
Database Requirements Analysis:

What we require our database to do after running queries, is to show the patients and their specific doctor. This could lead to multiple results because there are multiple doctors in a single office, we would like a query into the specific utilities at a medical office, and a query to show employees who makes more than others. Another query we would like to use is to gather which lab company is contracted at differing medical offices. We would also like a query into the doctor's educational history. Another query we plan to use is gathering all employees who worked with a specific patient. A query where we show which employee or doctor interacted with whatever patient would be interesting to try and solve. What lab result ties to whatever patient is something we will investigate also. There's plenty of queries that can be used to gather information from this database, and these specific queries listed might be subjected to change later but as for now this is what we'll be working with.

EER Model:

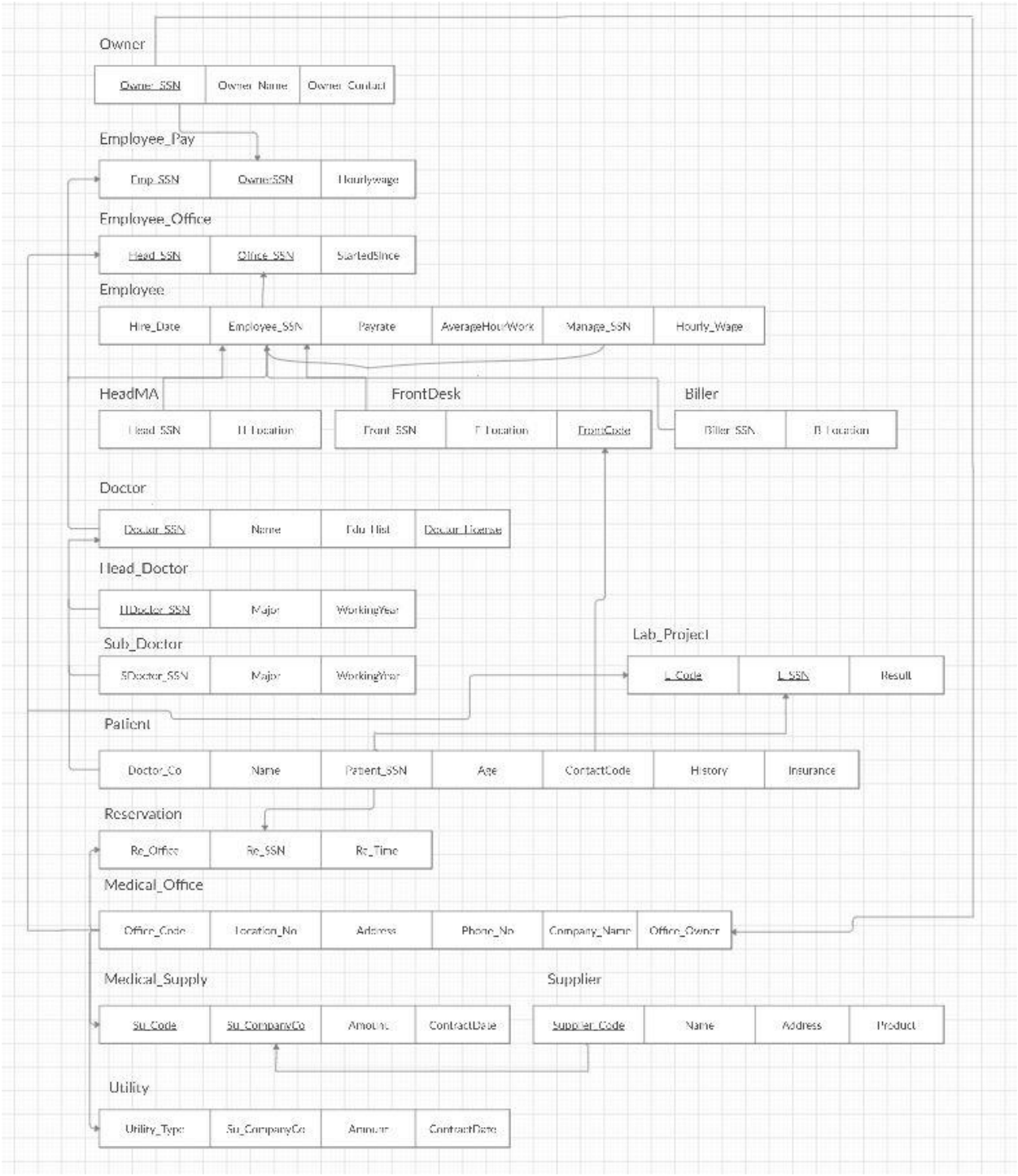
When it comes to the entities and relationships in our EER Model we have 19 entities and 11 relationships, with each entity having a specific relationship leaving none out. You have multiple patients who attend a medical office, utilities who contract under multiple medical offices and these utilities have a monthly fee, name, and address. Labs who have a contract to specific medical offices where they have a test result and patient ssn. Patient has the most attributes of all our entities which includes name, ssn, age, medical history, doctor's name, etc. Employees who work at a medical office, and employees who manages other employees. Doctors treats patients and medical suppliers supply medicine to multiple medical offices. Lastly you have a specific employee who mainly interacts with the patients and that is the front desk staff. So, on our EER model we drew a relationship between front desk employee, and patient with the relation being interacts.

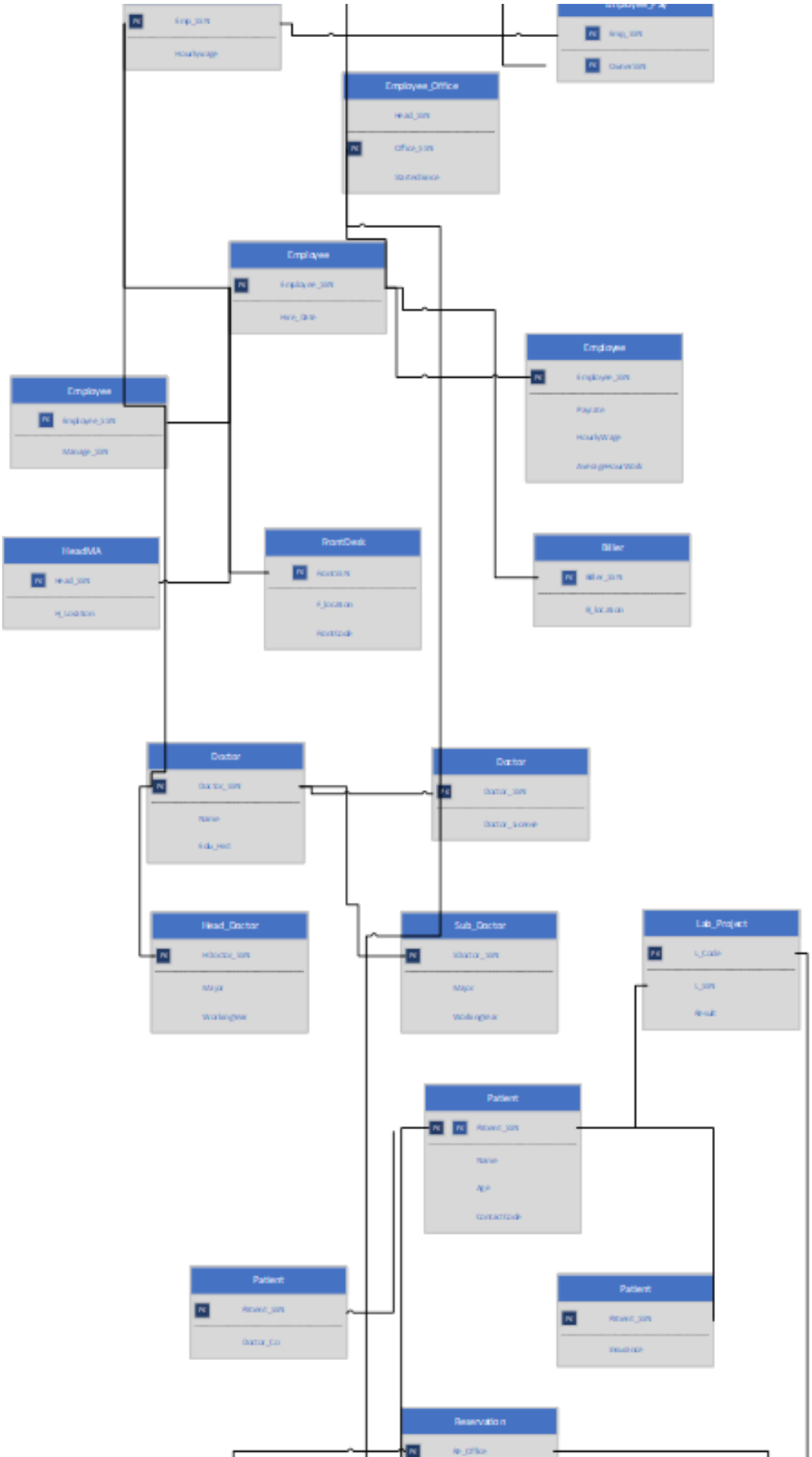
Below is the completed and finalized EER model, the only potential changes we'll possibly make to it is more than likely just grammatical, such as fixing spelling errors.



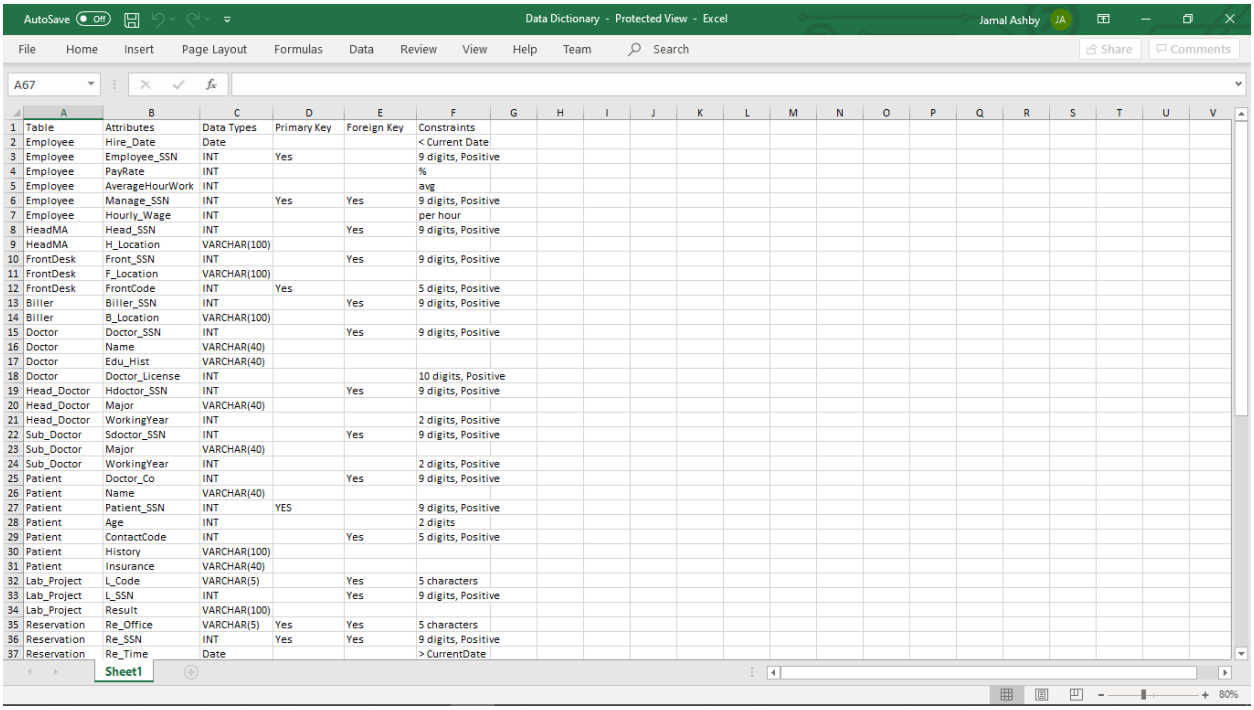
Relational Model(Mapping & Normalization):

Below is our schema, the first picture shows the relational model before normalization and the second picture shows the normalized relational model. Some parts of the normalized schema might be cut off, so I made sure to submit the original pdf file that contains it also. :

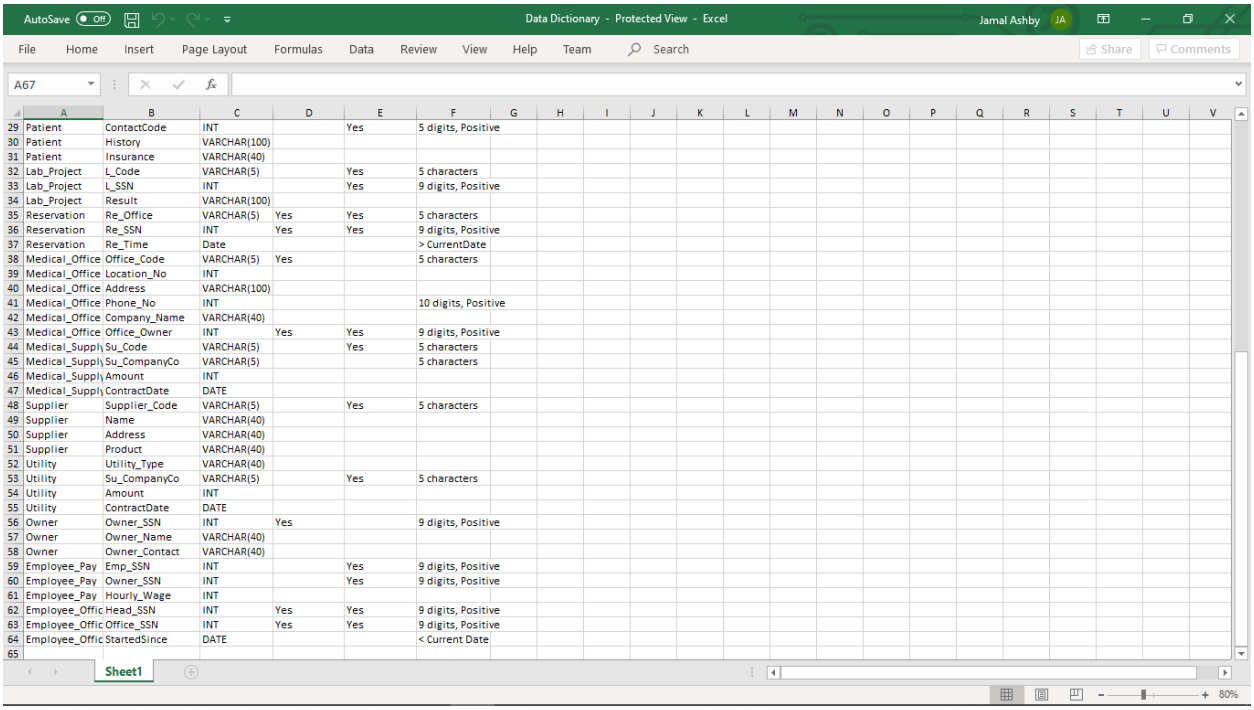

Owner
Owner_SSN
Owner_Name
Owner_Contact
Employee_Pay
Emp_SSN
OwnerSSN
Hourlywage
Employee_Office
Head_SSN
Office_SSN
StartedSince
Employee
Hire_Date
Employee_SSN
Payrate
AverageHourWork
Manage_SSN
Hourly_Wage
HeadMA
H_SSN
H_Location
FrontDesk
Front_SSN
F_Location
FrontCode
Biller
Biller_SSN
B_Location
Doctor
Doctor_SSN
Name
Edu_Hist
Doctor_License
Head_Doctor
HDoctor_SSN
Major
WorkingYear
Sub_Doctor
SDoctor_SSN
Major
WorkingYear
Lab_Project
L_Code
L_SSN
Result
Patient
Doctor_Co
Name
Patient_SSN
Age
ContactCode
History
Insurance
Reservation
Re_Office
Re_SSN
Re_Time
Medical_Office
Office_Code
Location_No
Address
Phone_No
Company_Name
Office_Owner
Medical_Supply
Su_Code
Su_CompanyCo
Amount
ContractDate
Supplier
Supplier_Code
Name
Address
Product
Utility
Utility_Type
Su_CompanyCo
Amount
ContractDate


Employee_Office
Employee
Employee
Employee
HeadMA
FrontDesk
Biller
Doctor
Doctor
Head_Doctor
Sub_Doctor
Lab_Project
Patient
Patient
Patient
Reservation

Data Dictionary:



	A	B	C	D	E	F
1	Table	Attributes	Data Types	Primary Key	Foreign Key	Constraints
2	Employee	Hire_Date	Date			< Current Date
3	Employee	Employee_SSN	INT	Yes		9 digits, Positive
4	Employee	PayRate	INT			%
5	Employee	AverageHourWork	INT			avg
6	Employee	Manage_SSN	INT	Yes	Yes	9 digits, Positive
7	Employee	Hourly_Wage	INT			per hour
8	HeadMA	Head_SSN	INT		Yes	9 digits, Positive
9	HeadMA	H_Location	VARCHAR(100)			
10	FrontDesk	Front_SSN	INT		Yes	9 digits, Positive
11	FrontDesk	F_Location	VARCHAR(100)			
12	FrontDesk	FrontCode	INT	Yes		5 digits, Positive
13	Biller	Biller_SSN	INT		Yes	9 digits, Positive
14	Biller	B_Location	VARCHAR(100)			
15	Doctor	Doctor_SSN	INT		Yes	9 digits, Positive
16	Doctor	Name	VARCHAR(40)			
17	Doctor	Edu_Hist	VARCHAR(40)			
18	Doctor	Doctor_License	INT			10 digits, Positive
19	Head_Doctor	Hdoctor_SSN	INT		Yes	9 digits, Positive
20	Head_Doctor	Major	VARCHAR(40)			
21	Head_Doctor	WorkingYear	INT			2 digits, Positive
22	Sub_Doctor	Sdoctor_SSN	INT		Yes	9 digits, Positive
23	Sub_Doctor	Major	VARCHAR(40)			
24	Sub_Doctor	WorkingYear	INT			2 digits, Positive
25	Patient	Doctor_Co	INT		Yes	9 digits, Positive
26	Patient	Name	VARCHAR(40)			
27	Patient	Patient_SSN	INT	YES		9 digits, Positive
28	Patient	Age	INT			2 digits
29	Patient	ContactCode	INT		Yes	5 digits, Positive
30	Patient	History	VARCHAR(100)			
31	Patient	Insurance	VARCHAR(40)			
32	Lab_Project	L_Code	VARCHAR(5)		Yes	5 characters
33	Lab_Project	L_SSN	INT		Yes	9 digits, Positive
34	Lab_Project	Result	VARCHAR(100)			
35	Reservation	Re_Office	VARCHAR(5)	Yes	Yes	5 characters
36	Reservation	Re_SSN	INT	Yes	Yes	9 digits, Positive
37	Reservation	Re_Time	Date			> CurrentDate



	A	B	C	D	E	F
29	Patient	ContactCode	INT		Yes	5 digits, Positive
30	Patient	History	VARCHAR(100)			
31	Patient	Insurance	VARCHAR(40)			
32	Lab_Project	L_Code	VARCHAR(5)		Yes	5 characters
33	Lab_Project	L_SSN	INT		Yes	9 digits, Positive
34	Lab_Project	Result	VARCHAR(100)			
35	Reservation	Re_Office	VARCHAR(5)	Yes	Yes	5 characters
36	Reservation	Re_SSN	INT	Yes	Yes	9 digits, Positive
37	Reservation	Re_Time	Date			> CurrentDate
38	Medical_Office	Office_Code	VARCHAR(5)	Yes		5 characters
39	Medical_Office	Location_No	INT			
40	Medical_Office	Address	VARCHAR(100)			
41	Medical_Office	Phone_No	INT			10 digits, Positive
42	Medical_Office	Company_Name	VARCHAR(40)			
43	Medical_Office	Office_Owner	INT	Yes	Yes	9 digits, Positive
44	Medical_Supply	Su_Code	VARCHAR(5)		Yes	5 characters
45	Medical_Supply	Su_CompanyCo	VARCHAR(5)			5 characters
46	Medical_Supply	Amount	INT			
47	Medical_Supply	ContractDate	DATE			
48	Supplier	Supplier_Code	VARCHAR(5)		Yes	5 characters
49	Supplier	Name	VARCHAR(40)			
50	Supplier	Address	VARCHAR(40)			
51	Supplier	Product	VARCHAR(40)			
52	Utility	Utility_Type	VARCHAR(40)			
53	Utility	Su_CompanyCo	VARCHAR(5)		Yes	5 characters
54	Utility	Amount	INT			
55	Utility	ContractDate	DATE			
56	Owner	Owner_SSN	INT	Yes		9 digits, Positive
57	Owner	Owner_Name	VARCHAR(40)			
58	Owner	Owner_Contact	VARCHAR(40)			
59	Employee_Pay	Emp_SSN	INT		Yes	9 digits, Positive
60	Employee_Pay	Owner_SSN	INT		Yes	9 digits, Positive
61	Employee_Pay	Hourly_Wage	INT			
62	Employee_Offic	Head_SSN	INT	Yes	Yes	9 digits, Positive
63	Employee_Offic	Office_SSN	INT	Yes	Yes	9 digits, Positive
64	Employee_Offic	StartedSince	DATE			< Current Date
65						

Implementation:

The first three pictures contains the project schema:

C:\Users\Jamal\Desktop\Project Report\ProjectSchema.sql - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

ProjectSchema.sql | ProjectData.sql | ProjectQueries.sql

```
CREATE DATABASE Medical_Office;
USE Medical_Office;

CREATE TABLE employee(
    hire_date date not null,
    employee_ssn int(9) not null,
    manage_ssn int(9),
    AvgHrWork int(3),
    primary key(employee_ssn)
);

CREATE TABLE headMA(
    head_ssn int(9) not null,
    h_location varchar(100),
    foreign key(head_ssn) references employee(employee_ssn)
);

CREATE TABLE frontdesk(
    front_ssn int(9) not null,
    f_location varchar(100),
    foreign key(front_ssn) references employee(employee_ssn)
);

CREATE TABLE biller(
    biller_ssn int(9) not null,
    b_location varchar(100),
    foreign key(biller_ssn) references employee(employee_ssn)
);

CREATE TABLE doctor(
    doctor_ssn int(9) not null,
    name varchar(40) not null,
    edu_hist varchar(40),
    doctor_license int(10) not null,
    primary key(doctor_ssn)
);

CREATE TABLE head_doctor(
    hdoctor_ssn int(9) not null,
    major varchar(40),
```

Structured Query Language file | length : 3,062 lines : 129 | Ln : 1 Col : 1 Sel : 0 | 0 | Windows (CR LF) | UTF-8 | INS

C:\Users\Jamal\Desktop\Project Report\ProjectSchema.sql - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

ProjectSchema.sql | ProjectData.sql | ProjectQueries.sql

```
    working_year int(4),
    foreign key(hdoctor_ssn)references doctor(doctor_ssn)
);

CREATE TABLE sub_doctor(
    sdoctor_ssn int(9) not null,
    major varchar(40),
    working_year int(4),
    foreign key (sdoctor_ssn) references doctor(doctor_ssn)
);

CREATE TABLE patient(
    doctor_co int(9) not null,
    name varchar(40) not null,
    patient_ssn int(9) not null,
    age int(3),
    contact_code int(5),
    history varchar(100),
    insurance varchar(40),
    primary key(patient_ssn),
    foreign key(doctor_co) references doctor(doctor_ssn)
);

CREATE TABLE supplier(
    supplier_code varchar(5),
    name varchar(40),
    address varchar(40),
    product varchar(40),
    primary key(supplier_code)
);

CREATE TABLE owner(
    owner_ssn int(9) not null,
    owner_name varchar(40) not null,
    owner_contact varchar(40),
    primary key(owner_ssn)
);

CREATE TABLE medical_office(
    office_code varchar(5) not null,
```

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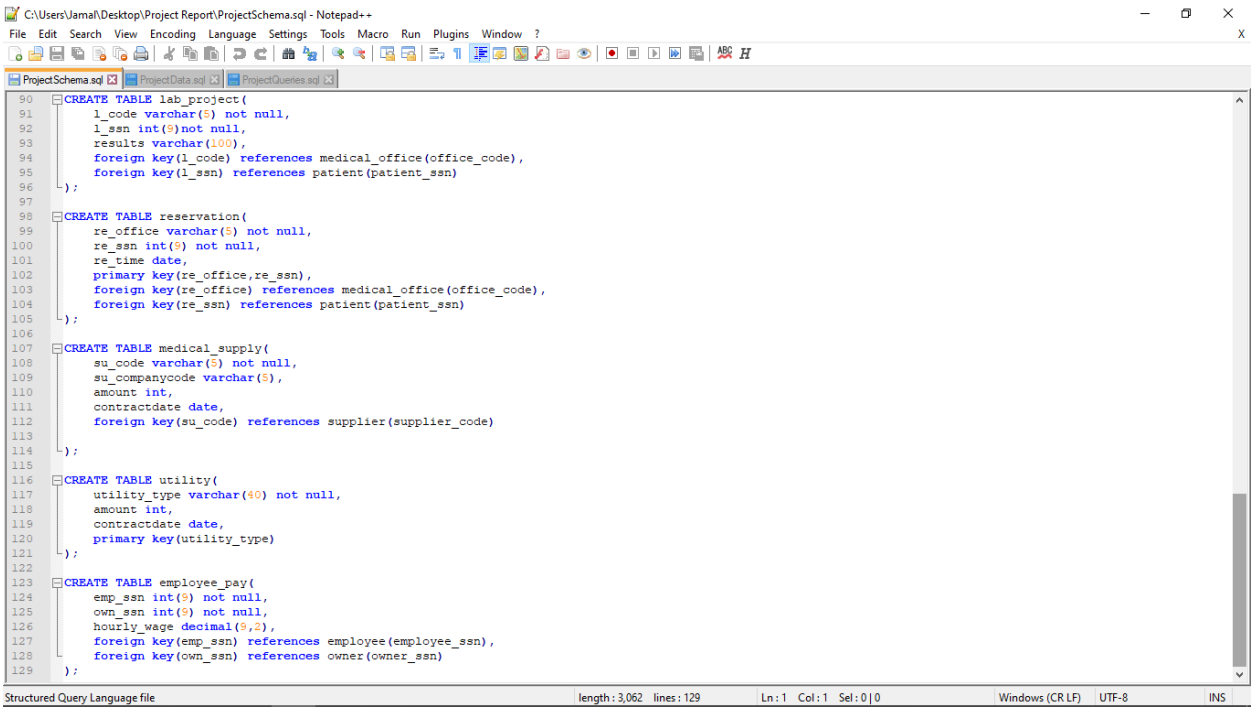
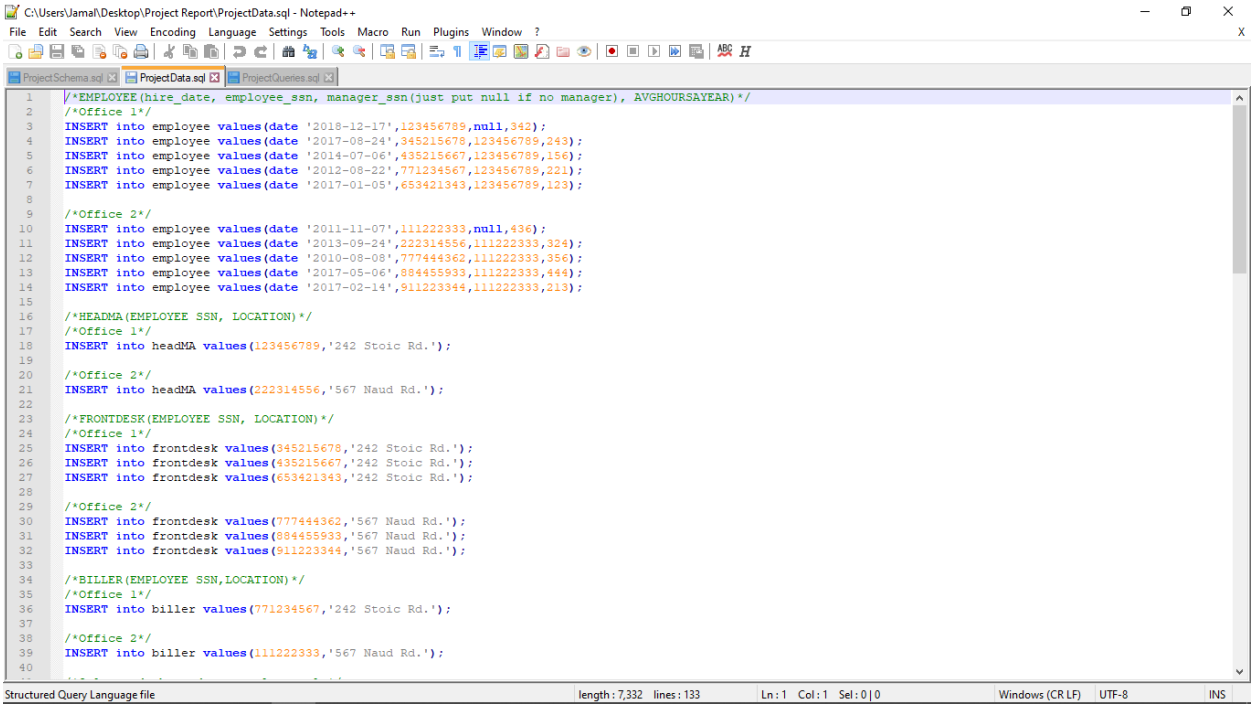


The next four pictures contain the insertion of the data:



C:\Users\Jamal\Desktop\Project Report\ProjectData.sql - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

ProjectSchema.sql | ProjectData.sql | ProjectQueries.sql

```
/*Only need these doctor values only*/
INSERT into doctor values(332211551,'Dubois Smith','Ph.D',9283765600);
INSERT into doctor values(221177445,'Frank Zane','Ph.D',8812234556);
INSERT into doctor values(665577889,'Clarisa Clark','Ph.D',0022004431);

/*Only need these doctor values only*/
INSERT into head_doctor values(332211551,'Pre-Med',1996);
INSERT into sub_doctor values(221177445,'Pharmaceutical',2014);
INSERT into sub_doctor values(665577889,'Psychology',2017);

/*PATIENT(DOCTOR_SSN, NAME, PATIENT_SSN,AGE,CONTACT_CODE(just put null),HEALTH HISTORY,INSURANCE)*/
INSERT into patient values(221177445,'Leroy Jenkins',123412345,26,null,'Scoliosis','Life Haven');
INSERT into patient values(332211551,'Eric Macoye',111111111,41,null,'Obesity','Anthem');
INSERT into patient values(221177445,'Lenin Spike',222222222,33,null,'High Blood Pressure','Humana');
INSERT into patient values(665577889,'Jamal Ashby',333333333,43,null,'Stroke','Aetna');
INSERT into patient values(332211551,'Ashan Michael',444444444,18,null,'Asthma','Cigna');
INSERT into patient values(221177445,'Latonda Williams',555555555,22,null,'Depression','Highmark');
INSERT into patient values(665577889,'Lisa Tran',666666666,32,null,'Arthritis','Molina Healthcare');
INSERT into patient values(221177445,'Matthew Tran',777777777,67,null,'Heart Disease','Kaiser Permanente');
INSERT into patient values(221177445,'Hoang Nguyen',888888888,34,null,'Osteoporosis','Anthem');
INSERT into patient values(332211551,'Lance Pappilion',999999999,45,null,'Epilepsy','Life Haven');

/*Only one owner is needed*/
INSERT into owner values(332211551,'Dubois Smith','345-657-2213');

/*MEDICAL_OFFICE(office_code, location_number,address,phone_number, company_name, owner_ssn)*/
/*Office 1*/
INSERT into medical_office values('8uy6y',1,'242 Stoic Rd.',2134335678,'Mic&Pat Clinic',332211551);

/*Office 2*/
INSERT into medical_office values('o9uyt',2,'567 Naud Rd.',4047556789,'Mic&Pat Clinic',332211551);

/*RESERVATION(office_code, patient_ssn, reservation_date)*/
INSERT into reservation values('8uy6y',123412345,date '2019-04-03');
INSERT into reservation values('o9uyt',111111111,date '2019-07-13');
INSERT into reservation values('8uy6y',222222222,date '2019-08-01');
INSERT into reservation values('o9uyt',333333333,date '2019-12-13');
INSERT into reservation values('8uy6y',444444444,date '2019-02-24');
INSERT into reservation values('o9uyt',555555555,date '2019-11-27');
INSERT into reservation values('8uy6y',666666666,date '2019-10-08');
```

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C:\Users\Jamal\Desktop\Project Report\ProjectData.sql - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

ProjectSchema.sql | ProjectData.sql | ProjectQueries.sql

```
INSERT into reservation values('o9uyt',777777777,date '2019-11-11');
INSERT into reservation values('8uy6y',888888888,date '2019-09-03');
INSERT into reservation values('8uy6y',999999999,date '2019-01-23');

/*lab_project(office_code, patient_ssn,health status)*/
INSERT into lab_project values('8uy6y',123412345,'Healthy');
INSERT into lab_project values('o9uyt',111111111,'Sickly');
INSERT into lab_project values('8uy6y',222222222,'Healthy');
INSERT into lab_project values('o9uyt',333333333,'Sickly');
INSERT into lab_project values('8uy6y',444444444,'Healthy');
INSERT into lab_project values('o9uyt',555555555,'Sickly');
INSERT into lab_project values('8uy6y',666666666,'Healthy');
INSERT into lab_project values('o9uyt',777777777,'Sickly');
INSERT into lab_project values('8uy6y',888888888,'Healthy');
INSERT into lab_project values('8uy6y',999999999,'Sickly');

/*SUPPLIER(supplier_code, company_name, address, product_name)*/
INSERT into supplier values('a0r43','McNeil Consumer Healthcare','Fort Washington, Pennsylvania','Tylenol');
INSERT into supplier values('xo945','Merck & Co., Inc.','Rome, Georgia','Belsomra');
INSERT into supplier values('44re3','Novo Nordisk','Los Angeles, California','Victoza');
INSERT into supplier values('l4rr5','Janssen','New York, New York','Invokana');
INSERT into supplier values('lwwq3','Daiichi Sankyo, Inc.','Chicago, Illinois','Tribenzor');
INSERT into supplier values('z9u8e','AstraZeneca','Houston, Texas','Symbicort');
INSERT into supplier values('p3er4','AstraZeneca','Phoenix, Arizona','Bydureon BCISE');

/*Medical_Supply(SUPPLIER CODE,null,AMOUNT, CONTRACT DATE)*/
INSERT into medical_supply values('a0r43',null,300,date '2019-08-09');
INSERT into medical_supply values('xo945',null,250,date '2019-07-19');
INSERT into medical_supply values('44re3',null,400,date '2019-11-14');
INSERT into medical_supply values('l4rr5',null,225,date '2019-10-12');
INSERT into medical_supply values('lwwq3',null,556,date '2019-01-01');
INSERT into medical_supply values('z9u8e',null,245,date '2019-09-17');
INSERT into medical_supply values('p3er4',null,100,date '2019-05-10');


/*UTILITY(Utility Type, Amount, Contract Date)*/
INSERT into utility values('Electricity',1,date '2019-11-11');
INSERT into utility values('Water',1,date '2019-11-13');
INSERT into utility values('Waste',1,date '2019-11-12');
```

8:12 PM
12/1/2019

C:\Users\Jamal\Desktop\Project Report\ProjectData.sql - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

ProjectSchema.sql | ProjectData.sql | ProjectQueries.sql

```
INSERT into lab_project values('8uy6y',888888888,'Healthy');
INSERT into lab_project values('8uy6y',999999999,'Sickly');

/*SUPPLIER(supplier_code, company_name, address, product_name)*/
INSERT into supplier values('a0r43','McNeil Consumer Healthcare','Fort Washington, Pennsylvania','Tylenol');
INSERT into supplier values('xo945','Merck & Co., Inc.','Rome, Georgia','Belsomra');
INSERT into supplier values('44re3','Novo Nordisk','Los Angeles, California','Victoza');
INSERT into supplier values('14rr5','Janssen','New York, New York','Invokana');
INSERT into supplier values('1wwq3','Daiichi Sankyo, Inc.','Chicago, Illinois','Tribenzor');
INSERT into supplier values('z9u8e','AstraZeneca','Houston, Texas','Symbicort');
INSERT into supplier values('p3er4','AstraZeneca','Phoenix, Arizona','Bydureon BCISE');

/*Medical_Supply(SUPPLIER CODE,null,AMOUNT, CONTRACT DATE)*/
INSERT into medical_supply values('a0r43',null,300,date '2019-08-09');
INSERT into medical_supply values('xo945',null,250,date '2019-07-19');
INSERT into medical_supply values('44re3',null,400,date '2019-11-14');
INSERT into medical_supply values('14rr5',null,225,date '2019-10-12');
INSERT into medical_supply values('1wwq3',null,556,date '2019-01-01');
INSERT into medical_supply values('z9u8e',null,245,date '2019-09-17');
INSERT into medical_supply values('p3er4',null,100,date '2019-05-10');


/*UTILITY(Utility Type, Amount, Contract Date)*/
INSERT into utility values('Electricity',1,date '2019-11-11');
INSERT into utility values('Water',1,date '2019-11-13');
INSERT into utility values('Waste',1,date '2019-11-12');
INSERT into utility values('Internet',1,date '2019-11-14');
INSERT into utility values('IT',1,date '2019-11-15');

/*EMPLOYEE_PAY(employee_ssn,owner_ssn,hourly_wage)*/
INSERT into employee_pay values(123456789,332211551,20.75);
INSERT into employee_pay values(345215678,332211551,14.65);
INSERT into employee_pay values(435215667,332211551,15.50);
INSERT into employee_pay values(771234567,332211551,16.55);
INSERT into employee_pay values(653421343,332211551,17.70);
INSERT into employee_pay values(111222333,332211551,21.75);
INSERT into employee_pay values(222314556,332211551,19.56);
INSERT into employee_pay values(777444362,332211551,18.45);
INSERT into employee_pay values(884455933,332211551,17.30);
INSERT into employee_pay values(911223344,332211551,17.50);
```

Structured Query Language file | length : 7,332 lines : 133 | Ln : 1 Col : 1 Sel : 0 | 0 | Windows (CR LF) | UTF-8 | INS

The last two pictures contains my queries:

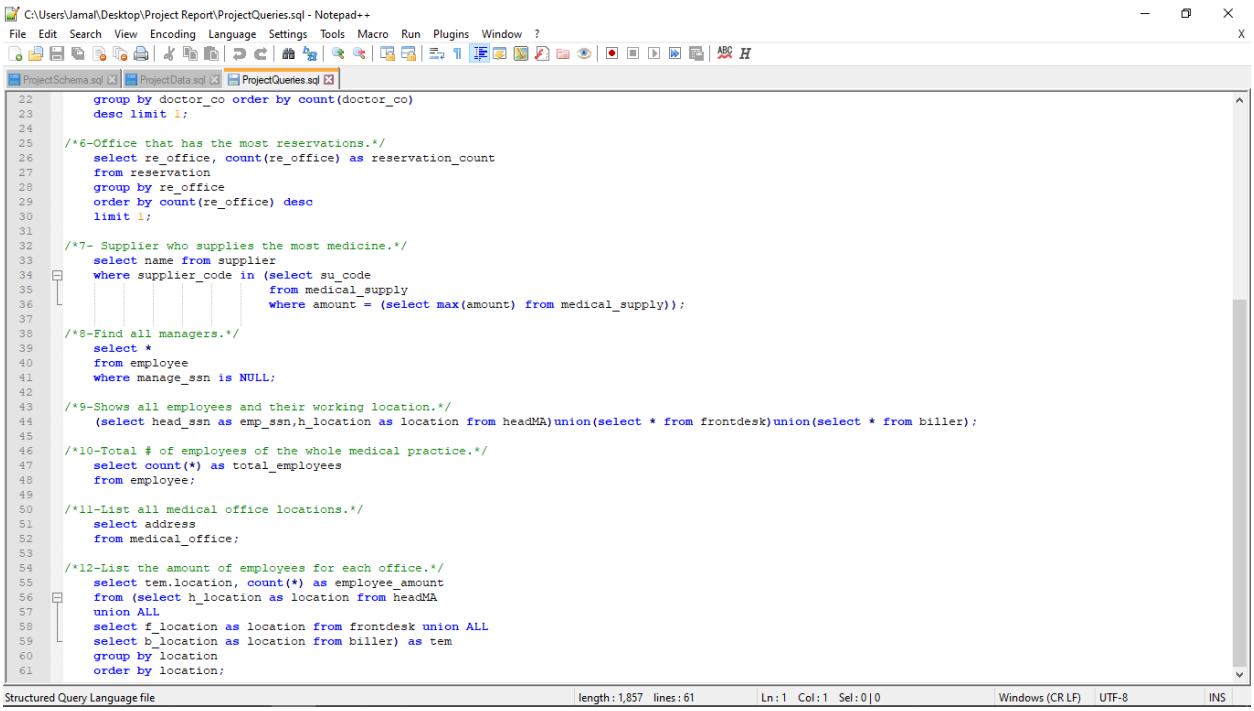
C:\Users\Jamal\Desktop\Project Report\ProjectQueries.sql - Notepad++

File Edit Search View Encoding Language Settings Tools Macro Run Plugins Window ?

ProjectSchema.sql | ProjectData.sql | ProjectQueries.sql

```
/*1-Owner name and contact information of the medical practice.*/
    select owner_name, owner_contact
    from owner;

/*2-Total number of patients at the medical practice.*/
    select count(*) as total_patients
    from patient;

/*3-Total of healthy lab results.*/
    select *
    from lab_project
    where results = 'Healthy';

/*4-Employee with the highest hourly wage.*/
    select emp_ssn, hourly_wage
    from employee_pay
    where hourly_wage = (select max(hourly_wage) from employee_pay);

/*5-Doctor with the most patients.*/
    select doctor_co, count(doctor_co) as doctor_patients
    from patient
    group by doctor_co order by count(doctor_co)
    desc limit 1;

/*6-Office that has the most reservations.*/
    select re_office, count(re_office) as reservation_count
    from reservation
    group by re_office
    order by count(re_office) desc
    limit 1;

/*7- Supplier who supplies the most medicine.*/
    select name from supplier
    where supplier_code in (select su_code
                            from medical_supply
                            where amount = (select max(amount) from medical_supply));

/*8-Find all managers.*/
    select *
    from employee
```

Structured Query Language file | length : 1,857 lines : 61 | Ln : 1 Col : 1 Sel : 0 | 0 | Windows (CR LF) | UTF-8 | INS



Teamwork:

When it comes to teamwork, all group members were helpful, and supportive when it comes to designing the database. Jamal Ashby's task was to work on the introduction, report, and create a rough draft of the EER Model. Abrham Dejene's task was to create the final version of the EER Model. Minho Song's task was to do the mapping part of the database. During time in class we got together to talk about how to split up these tasks evenly, so everyone gets a chance to do something without feeling left out. We also exchanged information and stay in contact out of class when it comes to the project. Minho also took care of the Data Dictionary, and Abrham finished the projects Normalization. Jamal's task was to do the implementation and finish the final report.

Member	**Task**
Ashby, Jamal	Introduction, Report, Implementation
Dejene, Abrham	EER Model, Normalization
Song, Minho	Mapping, Data Dictionary

Summary:

In conclusion, this project was great in helping us learn how to design a database that is ready to be used. Besides the SQL coding parts, we can take the time to appreciate how much work is put into designing a database and the different techniques that can be used to finalize your specific database. When it came to our functional dependencies, we found that we were able to get our queries to look up everything that was needed. The only true problem we ran into was during the implementation process, where there was a foreign key error and it wouldn't create a table. The problem was quickly fixed, and we were able to get everything working properly. Other than that, it was a pretty informative project and we can see ourselves using this knowledge in the future when going into the workforce or for future classes such as Web Design or Software Engineering.