**Proving our database in either 3NF or BCNF:**

We will look at each table and relation one by one

A few things that we already established:

1. Every table cell in every single table in our database contains one attribute.
2. Every tuple in every table in unique because we have a unique key for each one.

For each table below, we will test for 3NF and if possible BCNF.

A table is in 3NF if and only if for each of its non-trivial FDs, at least one of the conditions below hold:

1. The left-hand side is a super key.
2. The right-hand side is a prime attribute.

A table to be in BCNF, if and only if it is in 3NF and for each non-trivial FD

**Person (A, B, C, D, E, F, G, H, I, J):**

FDs:

For each FD in Person, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Area (A, B, C):**

FDs:

Postal codes are unique to each city and each city is in a province. Decomposing those attributes helps us transform the database to a higher normal form and removing redundant information.

For the only FD in area, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Age group (A, B, C):**

FDs:

For the only FD in age group, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Vaccine group (A, B):**

FDs:

For the only FD in vaccine group, LHS is a key. There is also no transitive dependency from non-prime attributes.

is subject to change at any times.

We have unique provinces in the country

Hence, this table is in BCNF, which is also in 3NF.

**Infection history (A, B, C):**

FDs:

For the only FD in infection history, LHS is a key. There is also no transitive dependency from non-prime attributes.

The same person can be infected more than once, but it is not possible to infected twice on the same day. Hence, the combo is a key.

Hence, this table is in BCNF, which is also in 3NF.

**Registered person (A, B, C):**

Registered Person is a Person, they have the same relations along with these new FDs:

Medicare number now acts as a key for registered person along with any keys in the hierarchy.

For the FDs in registered person, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Unregistered person (A):**

Unregistered Person is a Person, they have the same relations along with these new FDs:

This is a trivial FD.

Passport number is unique and now acts as a key for unregistered person along with any keys in the hierarchy.

For the FDs in unregistered person, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Public healthcare worker (A, B):**

Public healthcare worker is a Registered Person which is a Person, they have the same relations along with these new FDs:

SIN is unique and now acts as a key for registered person along with any keys in the hierarchy.

For the only FDs in public healthcare worker, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Works at (A, B, C, D):**

This relationship contains the employment history for all public healthcare employees.

Employee cannot be unique if an employee takes a break between dates. Combing all three attributes makes it a key.

For the FDs in works at, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Manages (A, B, C, D):**

This relationship contains the employment history for all public healthcare employees that are managers only.

Employee cannot be unique if an employee takes a break between dates. Combing all three attributes makes it a key.

For the FDs in manages, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Vaccine facility (A, B, C, D, E, F, G, H, I, J, K):**

FDs:

Vaccine facilities have many unique attributes and many of them can act as a key.

Removing the location and

For the FDs in vaccine facility, LHS is a key. There is also no transitive dependency from non-prime attributes.

Postal codes are unique to each city and each city is in a province. Decomposing those attributes helps us transform the database to a higher normal form and removing redundant information.

Hence, this table is in BCNF, which is also in 3NF.

**Vaccine (A, B, C, D):**

FDs:

Vaccine type is unique, but their statuses and dates could be changed at any time.

For the FDs in vaccine, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.

**Vaccine record (A, B, C, D, E, F, G, H):**

FDs:

A person ID is not enough to make a key, a person can be vaccinated more than once. A nurse could vaccinate the same person twice. However, they cannot be vaccinated twice at the same day.

For the FDs in vaccine records, LHS is a key. There is also no transitive dependency from non-prime attributes.

Hence, this table is in BCNF, which is also in 3NF.