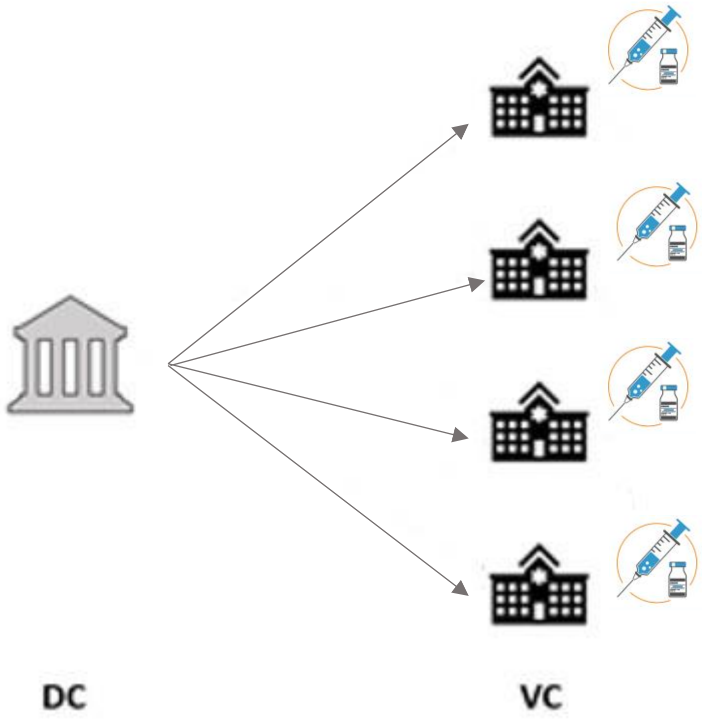
Model Development

Objective:

Minimizing Transportation Cost while ensuring **equity** in vaccine distribution

Assumption:

- Single period cold chain model
- Geographical equity
- Available vaccines are less than the demand
- Distribution centers have unlimited capacity



Model Development

Minimize $$\sum_{i\in I}\sum_{j\in J} c_{ij}w_{ij}$$

Subject to,

$$S_i \geq \sum_{j\in J} w_{ij} \qquad \forall i \in I$$

$$\sum_{i\in I} w_{ij} - U_j \geq 0 \qquad \forall j \in J$$

$$\sum_{i\in I} w_{ij} - h_j = 0 \qquad \forall j \in J$$

$$\left|\frac{h_j}{D_j} - \frac{h_k}{D_k}\right| \leq e \qquad \forall j \in J,\ \forall k \in J, k \neq j$$

$$h_j, w_{ij} \geq 0 \qquad \forall i \in I,\ \ \forall j \in J$$

Notation:

Sets:

I : Set of DC locations

J : Set of VC locations

Parameters:

D_j : Demand of customer

c_{ij} : Cost to transport 1 unit from DC at i to VC at j

d_{jk} : Cost to transport 1 unit from VC at j to VC at k, where $k \in J$

S_i : Total supply at DC at i

U_j : Capacity of DC at j

e : Equity parameter

r : Maximum distance within which transshipment is allowed

Decision variables:

w_{ij} = The number of units shipped from DC at i to VC at j

h_j = The number of units (customers) served from VC at j